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F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

COMPUTER SCIENCE

Paper I

(CS 101 : Problem Solving Using Computer and

'C' Programming)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Answer *all* the following :

[10×1=10]

(a) Define flowchart.

(b) 'C' is middle level language. Comment.

(c) State different data types.

(d) Who developed 'C' language ?

(e) Explain nested for loop.

(f) Write any *two* string functions.

(g) Define macro.

(h) State the use of `putc()` function.

(i) Which function is used to calculate X^n in 'C' from `math.h` library ? Give syntax.

(j) What is the meaning of `&` and `*` operators in pointer ?

P.T.O.

2. Answer the following (any *four*) : [4×5=20]

(i) Write short notes on the following with example :

(a) Call by value

(b) Call by reference.

(ii) Explain the following functions with example :

(a) fclose()

(b) fopen()

(c) fgets()

(d) fputs()

(e) fcloseall().

(iii) Explain with example :

(a) Global variable

(b) Local variable.

(iv) Differentiate between 'while' loop and 'do-while' loop.

(v) Explain with example :

(a) Relational operators

(b) Logical operators

(c) Increment operators.

3. Answer the following (any *four*) : [4×5=20]

(i) Write algorithm and draw flowchart for calculating maximum of two numbers.

(ii) Differentiate between structure and union.

(iii) What will be the output of the following code ? Justify :

(a) Main()

```
{
    int a=10, b=20;
    {
        int c=30;
        printf("%d %d %d", a, b, c);
    }
    printf("%d %d %d", a, b, c);
}
```

(b) Main()

```
{
    auto int i=10;
    {
        auto int i=20;
        printf("%d\n", i);
    }
    printf("%d\n", i);
}
```

(iv) Predicate the output for the following :

(a) Struct student

```
{
    char name [10];
    int rollno;
}
stu[4]=
```

```

{
    "smaran", 1,
    "sankalp", 2,
    "spandan", 3,
    "sarthak", 4
}

```

(b) main()

```

{
    struct student *ptr=stu;
    for (i=0, i<4; i++)
    {
        printf("At address %u : %s %d", ptr,
            ptr → name, ptr → rollno);
        ptr ++;
    }
}

```

(v) Explain the concept of recursion. Write a 'C' program to calculate factorial of a given number using recursion.

4. Answer the following (any four) : [4×5=20]

(i) Write a 'C' program to copy the contents of one file to another file.

(ii) Write a 'C' program to accept two matrices, add them and display the output.

(iii) Write a 'C' program to accept 'n' numbers and calculate sum of factorial such as :

for n=3; 1 ! + 2 ! + 3 ! = 9.

(iv) Write a 'C' program to count no. of digits, no. of spaces, no. of lower case letters and no. of upper case letters from a given input string.

(v) Write a 'C' program to print the following pattern :

(a) *
* * *
* * * * *

(b) 1
2 2
3 3 3
4 4 4 4

5. Answer the following (any *two*) : [2×5=10]

- (i) Explain actual parameters and formal parameters.
- (ii) Explain concept of pointer to pointer with example.
- (iii) Explain 'break' and 'continue' statement with example.

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

(CS : 102 File Organization and Fundamentals of Databases)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Assume suitable data, if necessary.

1. Answer *All* of the following :

[10×1=10]

(a) What is Hashing ?

(b) List the record based logical models.

(c) Define candidate key.

(d) What is decomposition ?

(e) Define 'domain'.

P.T.O.

- (f) What is Right Outer Join ?
- (g) List any *two* aggregate functions in SQL.
- (h) Who are Naive users ?
- (i) What is prime attribute ?
- (j) Define second normal form.

2. Answer any *four* of the following : [4×5=20]

- (a) What is DBMS ? What are the advantages and disadvantages of DBMS ?
- (b) Differentiate between primary and secondary index.
- (c) What is aggregation ? Explain with example.
- (d) What is referential integrity constraint ? Explain in brief.
- (e) Consider the following relation :

R(A, B, C, D, E) and the set of FD's defined on R as :

$F = \{A \rightarrow B, CD \rightarrow E, A \rightarrow C, B \rightarrow D, E \rightarrow A\}$

Compute the closure of F i.e. F^+ .

3. Answer any *four* of the following : [4×5=20]

- (a) Write a short note on data model.

- (b) Explain union and intersection operation in relational algebra.
- (c) What are undesirable properties of a bad database design ?
- (d) State and explain in short rules of inference for functional dependencies.
- (e) Write a note on functional components of DBMS.

4. (A) Answer any *three* of the following : [3×5=15]

(a) Consider the following relations

Emp (eno, ename, salary, commission, designation)

Dept (dno, dname, location)

Emp and Dept are related with many to one relationship.

Create a relational database in 3NF and solve the following queries in SQL :

- (i) Find out employees who are working at Aurangabad location.
- (ii) Find the maximum, minimum and average salary for every designation.
- (iii) Update commission for every employee by 6% who belong to botany department.

(b) Consider the following relations :

Wholesaler (wno, wname, address, city)

Product (Pno, Pname)

Wholesaler and product are related with many to many relationship.

Create a relational database in 3NF and solve the following queries in SQL :

(i) List the wholesalers of product 'Mouse'.

(ii) Count the number of wholesaler from 'Pune' city.

(iii) Delete records of wholesaler where product name is 'Scanner'.

(c) Consider the following relations :

Doctor (dno, dname, address, city)

Patient (Pno, Pname, address, disease)

Doctor and patient are related with many to many relationship.

Create a relational database in 3NF and solve the following queries in SQL :

(i) Find the number of patients visited by 'Dr. Pawar'.

(ii) Find the number of patients suffering from 'Cancer'.

(iii) Display doctor name and city who gives treatment to the patient 'Mr. Sagar'.

(d) Consider the following relations :

Movie (mno, mname, budget)

Actor (ano, aname, role)

Movie and Actor are related with one to many relationship.

Create a relational database in 3NF and solve the following queries in SQL :

(i) List the names of movie in which 'Salman' has acted.

(ii) List the budgetwise movie

(iii) Count the number of actors in movie 'PK'.

(B) Attempt any *one* of the following : [1×5=5]

(a) Consider the following relations :

Dept (dno, dname, location)

Emp (eno, ename, designation, dno, pno)

Project (Pno, Pname, Status)

Solve the following queries in relational algebra.

(i) List all the employees of 'inventory' department of 'Delhi' location.

(ii) Give the name of employees who are working on 'Blood Bank' project.

(iii) Give the name of manager from 'Purchase' department.

(iv) Find all employees having designation as 'Clerk'

(v) Give all employees working on project whose status is 'Incomplete'.

(b) Consider the following relations :

Student (sno, name, address, class)

Subject (subno, name)

Stud-sub (sno, subno, marks)

Solve the following queries in relational algebra :

(i) Display subjectwise student list.

(ii) Find the names of student having marks > 90

(iii) Count the total number of students for each subject.

(iv) Print the classwise student.

(v) Display the number of student having address as 'M.G. Road' and class is 'S.Y. BSC'.

5. (A) Suyog Hotel has many rooms. Rooms are classified as AC and Non-AC. Hotel provides the discount to customers who visit the hotel more than once. Hotel also has food section and laundry section. This facility gives to customer as per customer's

requirement. Every room of hotel has TV and telephone facility, which charge with the total cost of room.

(i) Design an E-R diagram.

(ii) Convert the E-R diagram into relational database in 3NF. [7]

(B) What is Cartesian product ? Explain with example. [3]

Or

Differentiate between specialization and generalization. [3]

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

MATHEMATICS

Paper I

(MTC-101 : Discrete Mathematics)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Answer any *eight* of the following : [16]

(i) Translate the following into symbolic form. Also write its negation.

‘There exists a real number x such that x^2 is less than or equal to 2.

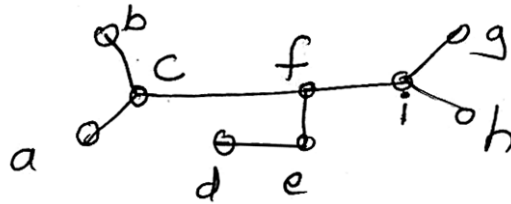
(ii) How many four letter words (sequences of letters with repetition) are there in which the first and the last letters are vowels ?

P.T.O.

- (iii) Find first four terms of $\{a_n\}$, where $a_n = 2a_{n-1} + a_{n-2}$,
 $a_0 = 1, a_1 = 1$.
- (iv) State Idempotent and Absorption laws in a lattice.
- (v) Draw the graph whose adjacency matrix is the following :

$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$

- (vi) Define self-complementary graph. Give *one* example.
- (vii) Draw the graph $K_{3,3}$ with usual notation. State whether this graph is a regular graph.
- (viii) Find centre of the following tree :



- (ix) Define complete symmetric digraph. Give *one* example.
- (x) How many edges are there in a graph with 6 vertices each of degree 3 ?

2. Attempt any *four* of the following : [16]

- (i) Translate the following argument into symbolic form and test the validity by using laws of logic. Either the artist is successful

or the has money problems. If he has money problems, then his life is miserable. If he is successful, then he is happy. He is not happy. Therefore, his life is miserable.

(ii) Solve the recurrence relation :

$$a_n - 3a_{n-1} + 2a_{n-2} = 0,$$

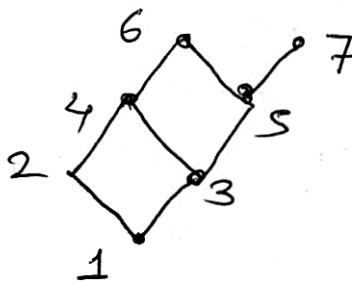
with initial condition $a_1 = 5, a_2 = 3$.

(iii) Among the integers 1, 2,, 200, if any 101 integers are chosen, then show that there are two among the chosen integers, such that one is divisible by the other.

(iv) Find the conjunctive normal form (CNF) of the Boolean function :

$$f(x, y, z) = (x + z) \cdot y$$

(v) Let $P = \{1, 2, 3, 4, 5, 6, 7\}$ be a poset whose Hasse diagram is given below :



(a) Find all upper bounds for $\{2, 3\}$

- (b) Find l.u.b. $\{2, 3\}$ if it exists
 - (c) Find g.l.b $\{3, 6\}$ if it exists
 - (d) Is this poset a lattice ? Justify.
- (vi) If the join operation is distributive over the meet operation in a lattice, then prove that the meet operation is also distributive over the join operation.

3. Attempt any *two* of the following : [16]

- (1) Solve the recurrence relation :

$$a_r - 7 a_{r-1} + 10 a_{r-2} = 3^r$$

with initial condition $a_0 = 0$ and $a_1 = 1$.

- (2) (a) Let L be a complemented lattice and $a, b \in L$, then prove that :

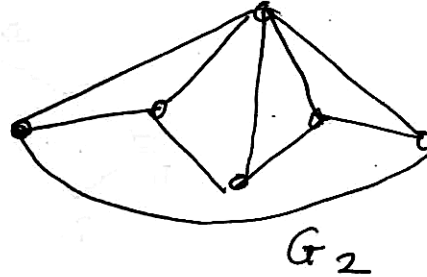
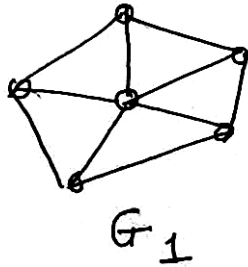
$$\overline{a \vee b} = \bar{a} \wedge \bar{b}$$

- (b) Draw Hasse diagram of lattice D_{28} . Is it a complemented lattice ? Justify.
- (3) How many integers between 1 and 1000 are divisible by ?
- (1) 2 or 3 or 5 ?
 - (2) 2 and 3 but not by 5 ?

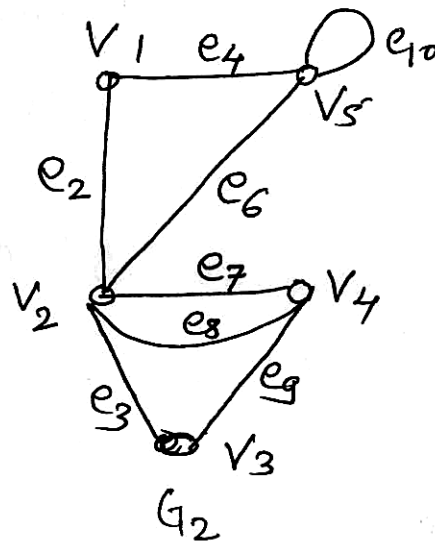
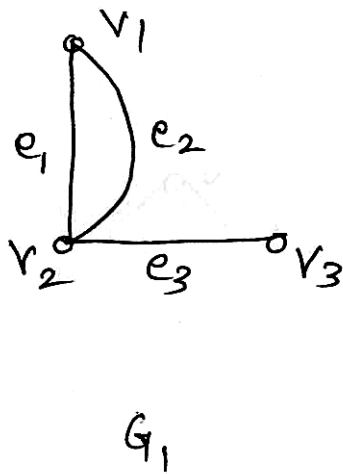
4. Attempt any *four* of the following :

[16]

(i) Are the following two graphs isomorphic ? Justify.



(ii) Find $G_1 \cup G_2$ and $G_1 \oplus G_2$ for the following graphs :



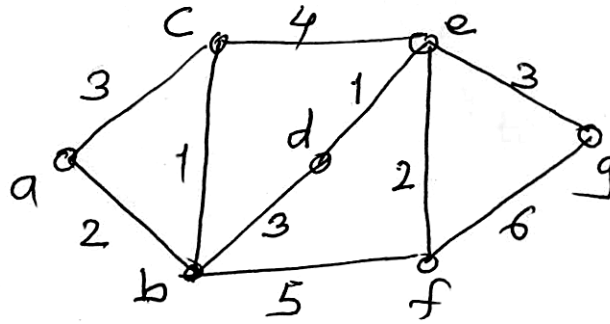
(iii) Prove that the maximum number of edges in a simple graph with n vertices and k components is :

$$\frac{(n - k)(n - k + 1)}{2}$$

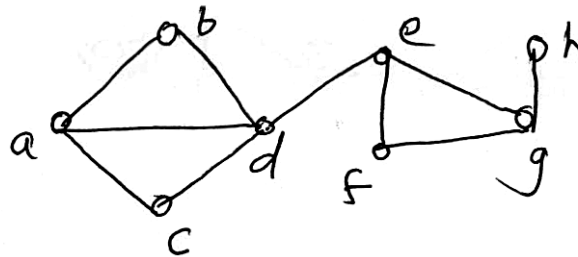
(iv) Draw the arborescence for the following expression and write it in polish notation :

$$(2x - y)^4 (x^3 + 9y)$$

- (v) Use Kruskal's algorithm to find the shortest spanning tree of the following graph. Also find weight of the shortest spanning tree :



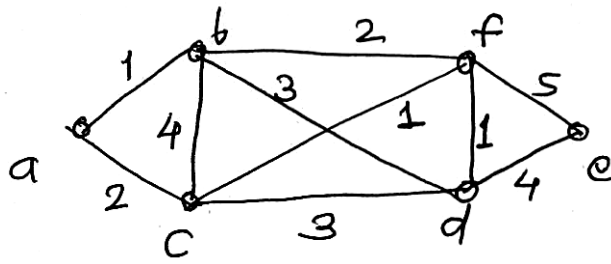
- (vi) Define the terms vertex connectivity and edge connectivity. Find vertex connectivity and edge connectivity of the following graph :



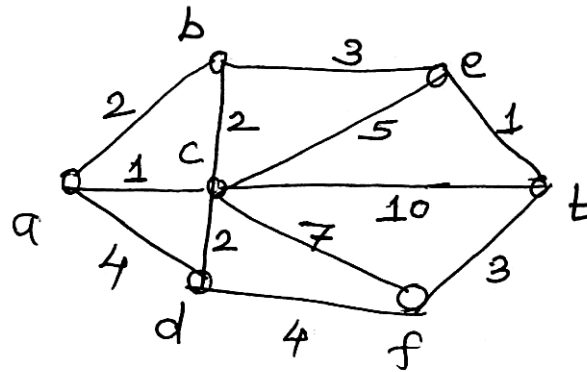
5. Attempt any *two* of the following : [16]

- (i) (a) Give example of a graph which is :
- (1) Eulerian and Hamiltonian
 - (2) Eulerian but not Hamiltonian.

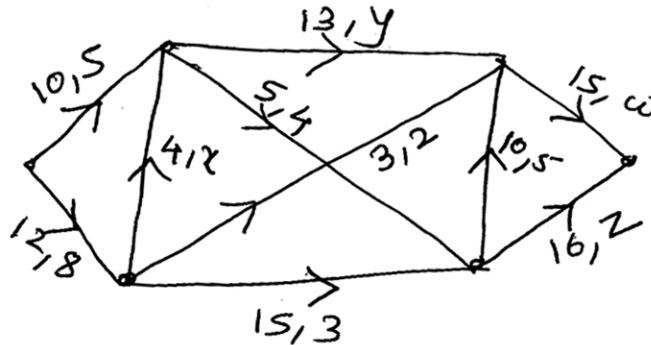
(b) Solve the following Chinese Postman problem :



(ii) Use Dijkstra's algorithm to find the shortest path from vertex a to t in the following graph :



(iii) (a) For the network shown below, find values of x, y, z and w in the network so that f is a flow in the network.



(b) Define the following graphs with one example :

- (1) Balanced digraph
- (2) Weakly connected digraph
- (3) Binary tree
- (4) Regular graph.

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

MATHEMATICS

Paper II

(MTC-102 : Algebra and Calculus)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

- N.B. :—**
- (i) All questions are compulsory.
 - (ii) Figures to the right indicate full marks.
 - (iii) Neat diagrams must be drawn wherever necessary.
 - (iv) Use of single memory, non-programmable, scientific calculator is allowed.

1. Attempt any *eight* of the following : [16]
- (1) Give an example of a relation on a set $A = \{1, 2, 3\}$ which is reflexive, symmetric but not transitive.
 - (2) If a , b and c are integers such that $a|b$, $b|c$, then prove that $a|c$.
 - (3) Define monoid. Give an example.
 - (4) Examine the continuity of the function $f(x)$ at $x = 0$ where :

$$f(x) = \frac{|x|}{x}.$$

P.T.O.

- (5) If $y = (ax + b)^m$, then find the n th derivative of y .
- (6) State Maclaurin's theorem with Lagrange's form of remainder.
- (7) Which elements of (\mathbb{Z}_6, \bullet) satisfy $x^2 = x$?
- (8) State first principle of mathematical induction.
- (9) Draw the diagraph of the relation :
 $R = \{(1, 2), (3, 4), (4, 2), (1, 4)\}$ on the set $A = \{1, 2, 3, 4\}$.
- (10) Determine the values of 'a' for which the following system has infinitely many solutions :

$$(a - 3)x + y = 0$$

$$x + (a - 3)y = 0.$$

2. Attempt any *four* of the following : [16]

- (1) If R is the relation of set $A = \{1, 2, 3, 4\}$ defined as xRy if and only if $x \leq y$, then draw diagraph of relation R and write the matrix of R .
- (2) Let $a, b, c, d \in \mathbf{Z}$. If $a \equiv b(\text{mod } n)$ and $c \equiv d(\text{mod } n)$, then prove that :
 - (i) $(a + c) \equiv (b + d)(\text{mod } n)$
 - (ii) $ac \equiv bd(\text{mod } n)$.
- (3) Find the remainder of 7^{483} when divided by 13.
- (4) If p is prime and a, b are integers such that $p|ab$, then prove that $p|a$ or $p|b$.
- (5) Let \mathbf{Z} be the set of all integers. Given $a, b \in \mathbf{Z}$, define $a \sim b$ if $a - b$ is an even integer. Then prove that \sim is an equivalence relation.

- (6) Determine whether the given permutation is even or odd. Also find the order of σ and σ^{-1} .

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 3 & 4 & 5 & 1 & 6 & 7 & 9 & 8 \end{pmatrix}$$

3. Attempt any *two* of the following : [16]

- (1) Using Warshall's algorithm obtain transitive closure of relation :

$R = \{(1, 2), (2, 2), (2, 4), (3, 2), (3, 4), (4, 1)\}$ on the set $A = \{1, 2, 3, 4\}$.

- (2) Let $G = \mathbf{Z}$, the set of integers. Define the binary operation $*$ as, $a * b = a + b - 2$, $a, b \in \mathbf{Z}$.

Show that $\langle \mathbf{Z}, * \rangle$ is an abelian group.

- (3) Show that 4999 and 1109 are relatively prime. Also find m & n such that $4999m + 1109n = 1$.

4. Attempt any *four* of the following : [16]

- (1) Verify Rolle's theorem for the function :

$$f(x) = \frac{\sin x}{e^x} \text{ on } [0, \pi].$$

- (2) Expand $\sin x$ in ascending power of $(x - \pi/2)$.

- (3) Solve the following system of linear equations by Gauss elimination method :

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4.$$

- (4) Discuss the continuity of $f(x)$ at $x = 0$ where :

$$f(x) = \frac{e^{1/x} - 1}{e^{1/x} + 1}, \quad x \neq 0$$
$$= 0, \quad x = 0$$

- (5) Find the n th derivative of $y = \frac{2x + 3}{x^2 + 3x + 2}$.

- (6) Find column rank of the following matrix :

$$A = \begin{bmatrix} 2 & -2 & 0 & 6 \\ 4 & 2 & 0 & 2 \\ 1 & -1 & 0 & 3 \\ 1 & -2 & 1 & 2 \end{bmatrix}.$$

5. Attempt any *two* of the following : [16]

- (1) State Leibnitz's theorem and prove that if $y = (\sin^{-1} x)^2$, then :

$$(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} - n^2y_n = 0.$$

- (2) Solve by LU decomposition method :

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 8.$$

- (3) (a) State and prove Cauchy's mean value theorem.

- (b) If in the Cauchy's mean value theorem $f(x) = e^x$, $g(x) = e^{-x}$ show that c is arithmetic mean between a & b .

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F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

ELECTRONICS SCIENCE

Paper I

ELC-101 : Principles of Analog Electronics

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. Attempt *all* of the following :

[8×2=16]

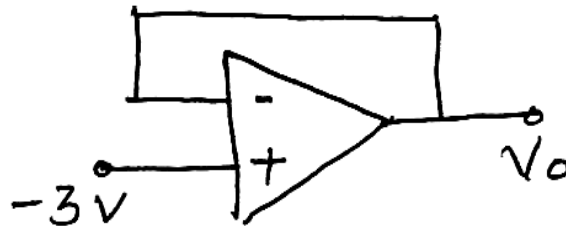
(a) Draw the circuit diagram of half wave rectifier.

(b) Define α and β for Bipolar junction transistor.

(c) Draw the circuit symbol for N channel and P channel JFET.

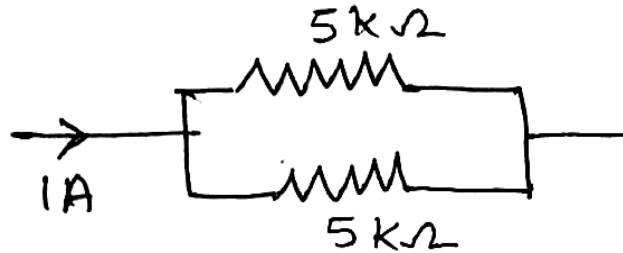
(d) State the different types of switches.

(e) Find the output of the following circuit :



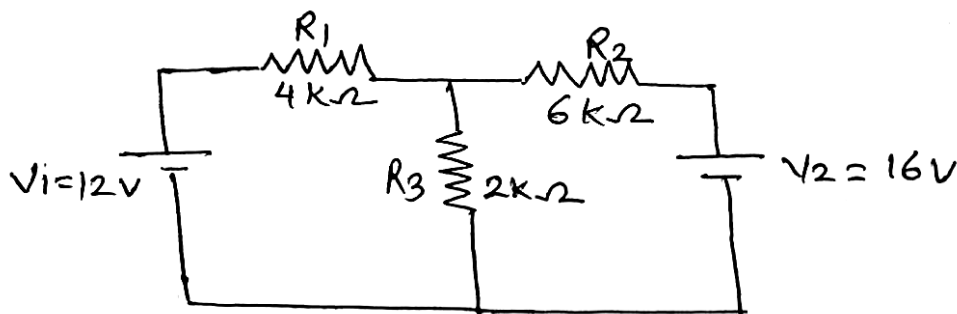
P.T.O.

- (f) Draw the output characteristics of transistor in CE configuration.
- (g) State maximum power transfer theorem.
- (h) Find the currents through each resistor.



2. Attempt any *four* of the following : [4×4=16]

- (a) Explain the working principle of transformer. Give different types of transformer.
- (b) Draw the circuit diagram for full wave rectifier and explain in detail.
- (c) Using superposition theorem find the current through R_3 .



- (d) Compare half wave and bridge rectifier.

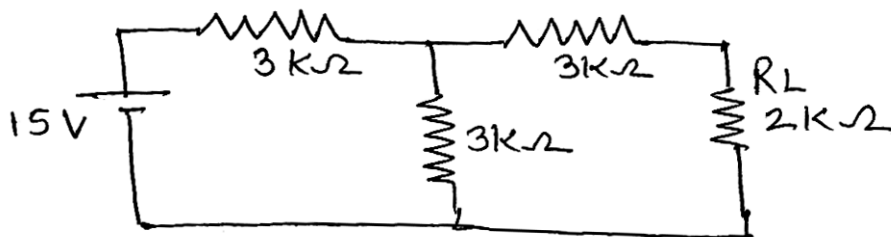
- (e) Draw the circuit diagram for RC high pass filter and explain the typical nature of its frequency response curve.
- (f) Explain the classification of resistor.

3. Attempt any *four* of the following : [4×4=16]

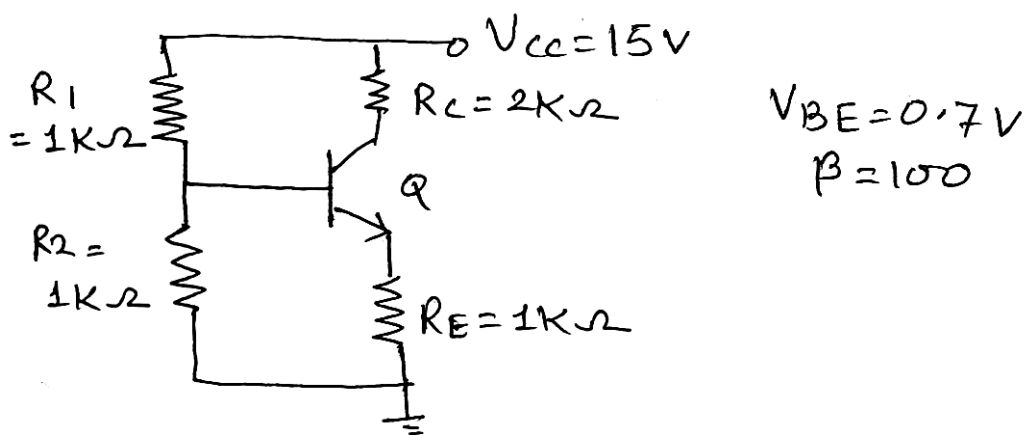
- (a) Compare CB, CE and CC configurations of transistor.
- (b) Explain the working of N-channel E-MOSFET.
- (c) Draw the circuit diagram of Op Amp as adder and derive the expression for its output voltage.
- (d) Explain the JFET as voltage variable resistor.
- (e) Classify the amplifiers on the basis of operating point.
- (f) Explain Op Amp as comparator.

4. Attempt any *four* of the following : [4×4=16]

- (a) Explain the working principle of relay.
- (b) Differentiate between BJT and FET.
- (c) Using Thevenin's theorem find the current through R_L .

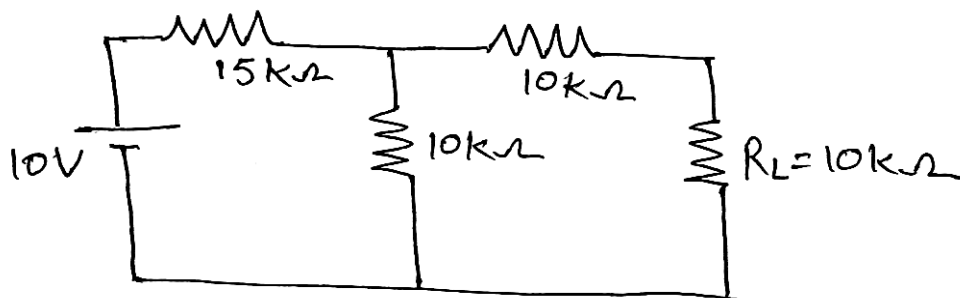


- (d) Explain the working principle of photodiode and its application.
- (e) Draw the circuit diagram for Op Amp as inverting and non-inverting amplifier.
- (f) Draw the DC load line for given circuit.

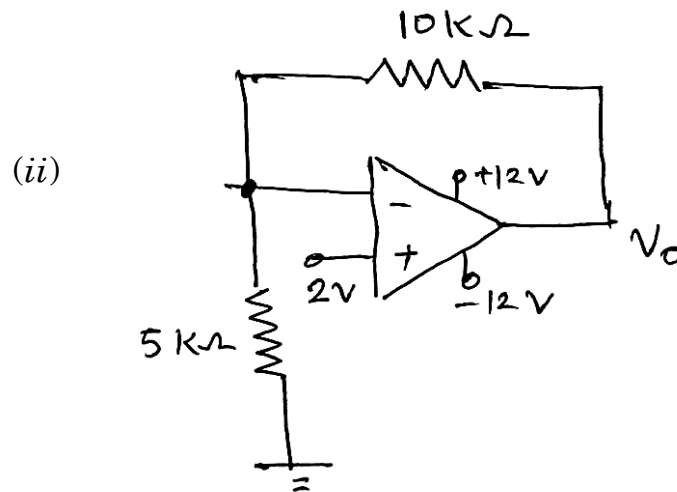
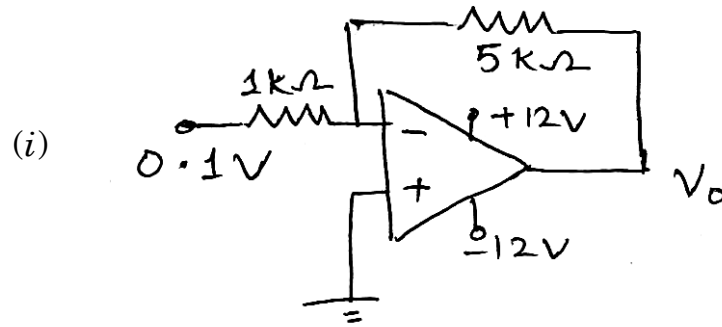


5. Attempt any *two* of the following : [2×8=16]

- (a) (1) Define Intrinsic stand off ratio for UJT. If $R_{B_1} = 4 k\Omega$, $R_{B_2} = 6 k\Omega$, find intrinsic stand off ratio.
- (2) Find Norton equivalent for the following circuit.



- (b) (1) Explain BJT as switch.
- (2) Identify the following Op-Amp configurations and find their output voltage.



- (c) (1) (i) In series LCR circuit if $L = 1 \text{ mH}$, $C = 0.01 \text{ } \mu\text{F}$. Find the resonant frequency.
- (ii) Draw the frequency response curve for LCR series resonance circuit.

- (2) (i) Define the terms purchase tolerance and wattage with respect to resistor.
- (ii) Find the values of the resistors have colour code :
- Brown, Black, Orange, Gold.
- Blue, Gray, Brown, Silver.

Total No. of Questions—5]

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[5116]-6

F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

ELECTRONICS

Paper-II

(ELC-102 : Principles of Digital Electronics)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) *All* questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. Attempt *all* of the following :

[8×2=16]

- (a) Give the radix of binary and hexadecimal number system.
- (b) Simplify $y = ABC + AB$ using rules of Boolean algebra.
- (c) Find one's complement of $(9D)_{16}$.
- (d) How many control lines are required for 256 : 1 multiplexer?
- (e) What do you mean by modulus of a counter ?
- (f) Write the truth table of tristate inverter.
- (g) Draw the logic symbol for positive edge triggered D-Flip-Flop and negative level triggered RS-Flip-Flop.
- (h) Distinguish between decoder and demultiplexer.

P.T.O.

2. Attempt any *four* of the following : [4×4=16]

- (a) With neat logic diagram explain the working of parity generator.
- (b) Construct all basic gates using NOR gates.
- (c) With neat logic diagram explain the working of full subtractor.
- (d) Perform the following :

(i) $(110111)_2 \equiv (?)_{\text{Gray}}$

(ii) $(875)_{10} \equiv (?)_{16}$

- (e) Convert the given SOP into standard form

$$y = A\bar{B} + \bar{C}$$

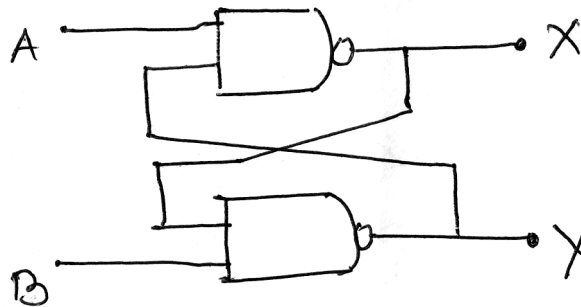
- (f) Subtract the following using 2's complement method.

$$(10001)_2 - (11100)_2$$

Comment on the result.

3. Attempt any *four* of the following : [4×4=16]

- (a) Draw logic diagram for decimal to BCD converter. Write the truth table for the same.
- (b) Explain the working of the following circuit.

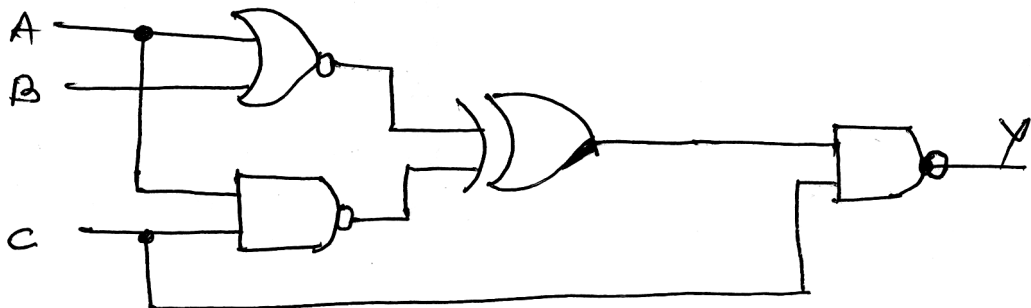


- (c) Explain the working of CMOS inverter with neat diagram.

- (d) With neat diagram explain working of 3-bit left shift serial in serial out shift register.
- (e) Explain the working of common cathode 7-segment display. Display 1 and 5 decimal numbers using common cathode 7-segment display.
- (f) Define the following parameters :
 - (i) Power Dissipation
 - (ii) Noise Margin
 - (iii) Switching Speed
 - (iv) Fan out.

4. Attempt any *four* of the following : [4×4=16]

- (a) Draw logic diagram of EX-OR gate and explain its working.
- (b) Write the truth table for the given circuit.



- (c) Explain block diagram of ALU.
- (d) Explain working of 4 : 1 multiplexer using NAND-NAND logic.
- (e) Explain working of 3-bit asynchronous down counter.
- (f) Show how IC 7490 can be connected for the following operation :
 - (i) MOD 7
 - (ii) MOD 3.

5. Attempt any *two* of the following :

[2×8=16]

(A) (a) Convert the following :

(i) $(1101111)_2 \equiv (?)_{16}$

(ii) $(527)_{10} \equiv (?)_{\text{Excess-3}}$

(b) Simplify the Boolean expression using K-maps :

$$y = \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}C + \bar{A}BC + ABC$$

Draw simplified diagram.

(B) (a) Explain the working of 2 bit digital comparator.

(b) Implement the following logic using multiplexer :

$$y = \bar{A}\bar{B}\bar{C}\bar{D} + ABCD + A\bar{B}\bar{C}\bar{D} + ABC\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D}$$

(C) (a) Explain working of 3×4 matrix keyboard encoder.

(b) What is race around condition ? Which Flip-Flop exhibits this condition ? How can race around condition be eliminated ?

Total No. of Questions—5]

[Total No. of Printed Pages—8

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[5116]-7

F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

STATISTICS

Paper I

(Statistical Methods—I)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory

(ii) Figures to the right indicate full marks.

(iii) Use of non-programmable, scientific calculator and statistical tables is allowed.

(iv) Symbols have their usual meaning unless otherwise stated.

1. (A) Fill in the blanks : [1 each]

(i) For a negatively skewed distribution, the relationship between mean, media and mode is

(ii) The mean of Poisson distribution is its variance.

(iii) Limits of multiple correlation coefficeint $R_{1.23}$ are

(iv) In Time series, the component having period of oscillation less than one year is called

P.T.O.

(B) Select the most appropriate option for each of the following : [1 each]

(i) For deciding most favorite actor, which is the most appropriate average ?

- (a) mean
- (b) median
- (c) mode
- (d) upper quartile

(ii) Variance is a measure of :

- (a) dispersion
- (b) central tendency
- (c) kurtosis
- (d) skewness

(iii) The probability distribution of a discrete random variable X is :

x_i	$P(X = x_i)$
1	0.1
2	0.3
3	0.4
4	0.2

What is $P(2 \leq x \leq 3)$?

- (a) 0.7
- (b) 0.3
- (c) 0.4
- (d) 1

(iv) The number of observations belonging to a class intervals is called as :

- (a) cumulative frequency
- (b) class width
- (c) class mark
- (d) frequency

(C) Attempt each of the following : [2 each]

- (i) State AR(1) model.
- (ii) If $b_{yx} = 0.7$ and $b_{xy} = 0.9$, find the value of r .
- (iii) State recurrence relation for the Binomial distribution.
- (iv) If X follows discrete uniform distribution with $n = 7$, find the variance of X.

2. Attempt any *four* of the following : [4 each]

- (a) Discuss median as a measure of central tendency. State merits and demerits of median.
- (b) The daily expenditure of 100 people is as follows :

Expenditure	Number of Persons
20—30	14
30—40	—
40—50	27
50—60	—
60—70	15

If the mode of the distribution is 43, find the missing frequencies.

- (c) Describe the procedure to plot less than ogive curve for a grouped frequency distribution.
- (d) Consider the following data related to income in two villages :

	Village A	Village B
Number of persons	70	60
Mean income (Rs.)	280	310
Variance of income	144	169

- (i) In which village the average income is more ? Justify your answer.
- (ii) In which village the variation in income is more ? Justify your answer.
- (e) Define quartiles. Describe procedure to compute third quartile for a grouped frequency distribution.
- (f) The profits (in lakhs of Rs.) of 15 companies for financial year 2015-16 are as follows :
- 24, 21, 35, 48, 42, 27, 52, 43, 40, 47, 55, 25, 50, 33, 44.
- Draw a stem and leaf chart.

3. Attempt any *four* of the following : [4 each]

- (a) Explain the terms exclusive class interval and coefficient of variation.
- (b) Consider the following data related to marks of students in division A and division B in statistics :
- | | | | |
|------------|------------|------------|------------|
| Division A | $Q_1 = 23$ | $Q_2 = 52$ | $Q_3 = 78$ |
| Division B | $Q_1 = 34$ | $Q_2 = 52$ | $Q_3 = 68$ |
- Determine marks of which division are more skewed ? Justify your answer.

- (c) Explain concept of kurtosis. State its types with help of frequency curve.
- (d) The standard deviation of a distribution is 5. What should be the value of fourth central moment so that distribution will be (i) mesokurtic (ii) leptokurtic ?
- (e) Consider the function $P(x) = K(x^2 + 4)$, $x = 0, 1, 2, 3$:
- (i) Find the value of K for which P(x) will be valid p.m.f.
- (ii) Find distribution function of X.
- (iii) Find the value of mode of X.
- (f) Describe in brief a Binomial experiment. State probability mass function (p.m.f.) of Binomial distribution. Also state expression for its mean.

4. Attempt any *two* of the following : [8 each]

- (A) (i) What is regression ? State any *two* properties of regression coefficients.
- (ii) For a trivariate data, $\sigma_1 = 4$, $\sigma_2 = 8$, $\sigma_3 = 7$, $r_{12} = 0.45$, $r_{13} = 0.55$, $r_{23} = 0.65$. Find the values of $b_{12.3}$ and $r_{23.1}$.
- (B) (i) Explain in brief the procedure of fitting line of regression of X on Y for a bivariate data by method of least squares.

(ii) The following is the distribution function of a discrete random variable X :

X	F(x)
0	0.05
1	0.20
2	0.40
3	0.90
4	0.99
5	1.0

- (1) Find p.m.f. of X
- (2) Find $P(X > 3)$
- (3) Find $P(1 < X \leq 5)$.

(C) (i) Explain concept of partial correlation in a trivariate data with help of an example.

(ii) Let X follows Poisson distribution with parameter 4 and Y follows Poisson distribution with parameter 6. X and Y are independent.

Find the distribution of (X + Y). Also find $P[(X = 5) / (X + Y) = 9]$.

(D) (i) If the probability that a certain test gives a positive reaction is 0.4. What is the probability that less than 3 negative reactions occur before the first positive reaction.

(ii) Consider the following calculations for a bivariate data of size 10 :

$$\begin{aligned} \Sigma x &= 165 & \Sigma y &= 178 & \Sigma x^2 &= 3591 \\ \Sigma y^2 &= 3788 & \Sigma xy &= 3606 \end{aligned}$$

Find the correlation coefficient between X and Y and interpret its value.

5. Attempt any *one* of the following : [16 each]

(A) (i) Describe the procedure of fitting equation $y = ax^b$ for a bivariate data.

(ii) In the regression analysis the equation of two lines of regression are $2X + 3Y = 8$ and $2Y + X = 5$ and the variance of $X = 4$.

Find :

- (1) Mean values of X and Y
- (2) Coefficient of correlation between X and Y
- (3) The standard deviation of Y .

(B) (i) A teacher of mathematics wants to determine the relationship between grades in the final examination and two internal tests given during the semester. Let X_1 , X_2 and X_3 denote the grades of a student in the final examination, first test and second test respectively. He obtained the following computation for a total of 120 students :

$$\bar{X}_1 = 7.4 \quad \bar{X}_2 = 6.8 \quad \bar{X}_3 = 7.0$$

$$\sigma_1 = 0.9 \quad \sigma_2 = 1 \quad \sigma_3 = 0.8$$

$$r_{12} = 0.60 \quad r_{13} = 0.70 \quad r_{23} = 0.65$$

- (1) Find the equation of plane of regression of X_1 on X_2 and X_3 .
- (2) Estimate X_1 when $X_2 = 6$ and $X_3 = 6.5$.

(ii) Estimate trend value using method of moving averages with $m = 4$ for the following data on the number of students studying in a college during years 2001 to 2010 :

Year	Number of Students
2001	3320
2002	3170
2003	3570
2004	3920
2005	4020
2006	4050
2007	4100
2008	4270
2009	4050
2010	4380

Total No. of Questions—5]

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[5116]-8

F.Y. B.Sc. (Computer Science) EXAMINATION, 2017

STATISTICS

Paper-II

(Statistical Methods—II)

(2013 PATTERN)

Time : Three Hours

Maximum Marks : 80

N.B. :— (i) All questions are compulsory

(ii) Figures to the right indicate full marks.

(iii) Use of non-programmable, scientific calculator and statistical tables is allowed.

(iv) Symbols have their usual meanings unless otherwise stated.

1. (A) Attempt each of the following : [1 mark each]

(i) Every subset of a sample space is called as

(ii) If two events A and B are mutually exclusive, then $P(A \cap B) = \dots\dots\dots$

(iii) If random variable X follows uniform distribution in (a, b) , then its mean is given by

(iv) Probability of rejecting H_0 when H_0 is true is called as

P.T.O.

(B) Attempt each of the following : [1 mark each]

(i) Which of the following tests is not a non-parametric test ?

- (a) Sign test
- (b) Mann-Whitney U test
- (c) Large sample test
- (d) Run test

(ii) If $A \subset B$, then $P(A/B) =$

- (a) 1
- (b) $\frac{P(A)}{P(B)}$
- (c) $\frac{P(A \cap B)}{P(A)}$, $P(A) > 0$
- (d) $\frac{P(A)}{P(B)}$, $P(B) > 0$

(iii) If event A denotes getting a multiple of 5 on a die, then A is :

- (a) Sure event
- (b) An impossible event
- (c) An elementary event
- (d) Disjoint event

(iv) A function of population values is known as :

- (a) Statistic
- (b) Level of significance
- (c) Sample
- (d) Parameter

(C) Attempt each of the following : [2 marks each]

(i) A continuous random variable X has the p.d.f.

$$f(x) = \begin{cases} kx^3, & 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

Find the value of k .

(ii) Define non-deterministic experiment with an example.

(iii) State lack of memory property of an exponential distribution.

(iv) State any *two* merits of simulation.

2. Attempt any *four* of the following : [4 marks each]

(a) Define each of the following with an example :

(i) Combination and

(ii) Permutation of objects when all are distinct.

(b) Two fair dice are thrown and the outcomes on the uppermost faces are noted. Find the probability that :

(i) The sum of the two numbers is even

(ii) The sum of the two numbers is at least 8.

(c) Define each of the following with an illustration :

(i) Sample space

(ii) Exhaustive events.

(d) In a random arrangement of the letters of the word "COMPUTER", find the probability that :

(i) All the vowels come together

(ii) The vowels occupy even places.

- (e) State axioms of probability. Also prove that “For any event A defined on Ω , $0 \leq P(A) \leq 1$ ”.
- (f) Three books are selected at random from a shelf containing 4 books on computers, 2 books of Mathematics and a dictionary. What is the probability that : (i) 2 books on computers and 1 book on Mathematics are selected, (ii) dictionary is not selected ?
- 3.** Attempt any *four* of the following : [4 marks each]
- (a) (i) Define independence of two events A and B defined on a sample space Ω .
(ii) State Bayes’ Theorem.
- (b) The events A_1 , A_2 and A_3 form a partition of sample space. If $3P(A_1) = 2P(A_2) = 3P(A_3)$, find $P(A_1 \cup A_2)$.
- (c) Define each of the following :
(i) Mutually exclusive events
(ii) Complement of an event
(iii) Union of two events
(iv) Conditional probability.
- (d) If mean and variance of U[a, b] distribution are 5 and 3 respectively, determine the values of a and b .
- (e) Define each of the following :
(i) Probability density function (p.d.f.) of a continuous random variable.
(ii) Variance of a continuous random variable.

(f) If $X \rightarrow N(1, 9)$ and $Y \rightarrow N(2, 16)$ are independent random variables, calculate :

(i) $P(5 \leq X \leq 7)$

(ii) $P(X + Y \geq 5)$.

4. Attempt any *two* of the following : [8 marks each]

(A) (i) Define normal distribution. State normal approximation to binomial distribution.

(ii) The amount of time that a computer will work without having to be reset is a random variable having an exponential distribution with mean of 120 hours. Find the probability that such a computer will (1) have to be reset in less than 25 hours and (2) not have to be reset in at least 180 hours.

(B) (i) Define distribution function of a continuous random variable. State any *two* properties of the distribution function.

(ii) A driver buys petrol either at a petrol pump P or at petrol pump S and the following arrangement shows the order of the petrol pump from which he bought petrol over a certain period of time :

PPSPSPSSPPSPSPSPSSPSS

Test the randomness of the above sequence at 5% level of significance (l.o.s.).

- (C) (i) Explain the method of drawing a model sample from an exponential distribution with mean θ .
- (ii) A low-noise transistor for use in computing products is being developed. It is claimed that the mean noise level will be below 2.5 dB level of products currently in use. A sample of 16 transistors yields mean noise level 1.8 dB level with standard deviation 0.8 dB level. Test the claim at 5% level of significance.
- (D) (i) Describe procedure of sign test.
- (ii) If X is a random variable with probability density function :

$$f(x) = \begin{cases} \frac{x^2}{3}, & -1 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

$$\text{If } A = \{x/x \geq 0\}, B = \{x/ -\frac{1}{2} \leq x \leq \frac{1}{2}\}$$

Find P(A), P(B) and P(A \cap B).

5. Attempt any *one* of the following :

- (A) (i) Define each of the following : [4]

Population

Null hypothesis

Sampling distribution of a statistic

Critical region.

(ii) A new computer network is being designed. The maker's claim that it is compatible with more than 99% of the equipment already in use. A sample of 300 programs is run and 298 of these run with no changes necessary that is, they are compatible with the new network. Test the maker's claim at 5% l.o.s. [4]

(iii) A bank utilizes four teller windows to render fast service to the customers. On a particular day 800 customers were observed. They were given service at the different windows as given below : [8]

Window Number	Number of Customers
1	150
2	250
3	170
4	230

Test whether the customers are uniformly distributed over the windows. Use 5% l.o.s.

(B) (i) Explain the large sample test for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$. [4]

(ii) In a radio listener's survey 120 persons were interviewed and their opinions about preference to Hindi or Marathi music were asked. The results are as follows : [4]

Type of Music	Opinion about Preference	
	Hindi	Marathi
I	13	45
II	39	23

Test whether the preference for music type is independent of language at 5% level of significance.

(iii) Let X denote the number of lines of executable SAS code, and let Y denote the execution time in seconds. Use the following summary information : [8]

$$n = 10, \sum_{i=1}^{10} x_i = 16.75, \sum_{i=1}^{10} y_i = 170, \sum_{i=1}^{10} x_i^2 = 28.64,$$

$$\sum_{i=1}^{10} y_i^2 = 2898, \sum_{i=1}^{10} x_i y_i = 285.625$$

- (1) Compute the value of regression coefficient of Y and X and
- (2) Test the significance of regression coefficient of Y on X at 1% l.o.s.

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-101

S.Y. B.Sc. (First Semester) EXAMINATION, 2017

COMPUTER SCIENCE

(211 : Data Structure Using 'C')

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) Figures to the right indicate full marks.

(ii) *All* questions carry equal marks.

(iii) Assume suitable data, if necessary.

(iv) *All* questions are compulsory.

1. Attempt *all* of the following : [10×1=10]

(a) What are the component of space complexity ?

(b) Define stable sorting.

(c) What is circular linked list ?

(d) Name the data structure used in recursion.

(e) Write the statement to increment rear in a circular queue implemented using array.

(f) How many nodes in a tree have no ancestors ?

(g) Which data structure is used for BF's.

P.T.O.

- (h) What are the advantages of ADT ?
- (i) What are different asymptotic notations ?
- (j) How are the elements of an array stored in memory ?

2. Attempt any *two* of the following : [2×5=10]

- (a) Write a 'C' function to compare two BST.
- (b) Write a 'C' function for adding and deleting elements from a circular queue.
- (c) Write a 'C' function to reverse singly linked list.

3. Attempt any *two* of the following : [2×5=10]

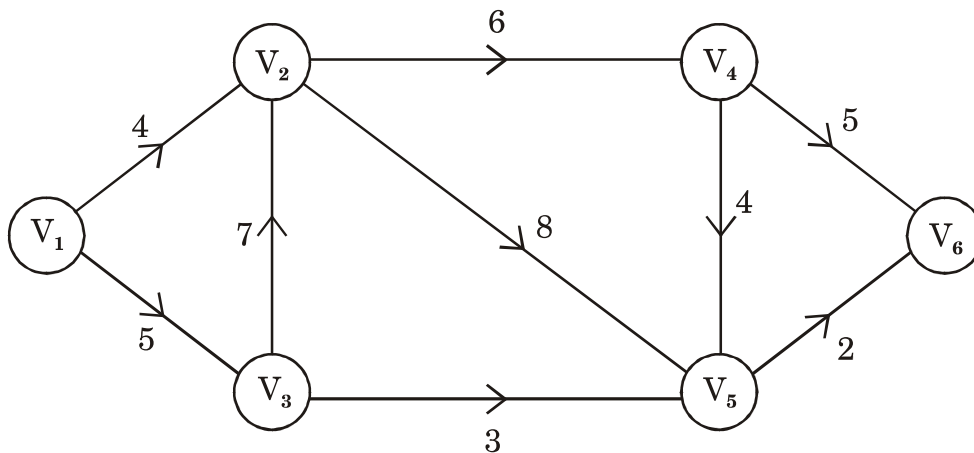
- (a) Sort the following data using quick sort :

12, 24, 9, 46, 31, 53, 33.

- (b) Construct AVL tree for the following data.

Pen, Eraser, Book, Scale, Sketchpen, Crayon, Colorpencil.

- (c) Find critical path for the following diagram :



4. Attempt either A or B :

(A) (i) Convert the following infix expression to postfix expression showing the contents of stack at each step : [4]

(A + (B * C - (D/E ^ F) * G) * H)

(ii) Write an algorithm for binary search. Also state its complexity. [3]

(iii) Explain DFS with example. [3]

(B) (i) Define the following terms : [4]

(1) Skewed Binary tree

(2) Priority queue

(3) Complete graph

(4) Multiple stack.

(ii) What is generalized linked list ? Explain with example. [3]

(iii) Give the O/P of the following code : [3]

```
int i=1, x, y, z;
```

```
initstack( );
```

```
while(i < 3)
```

```
{
```

```
    push(i * i);
```

```
    i=i+1;
```

```
}
```

```
x=pop( );
y=pop( );
push(i * i);
z=pop( );
push(x + y + z);
push(x * y);
while (! stack empty( ))
    printf("\n%d", pop( ));
```

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-102

S.Y. B.Sc. (First Semester) EXAMINATION, 2017

COMPUTER SCIENCE

[CS-212 Relational Database Management System (RDBMS)]

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—** (i) Figures to the right indicate full marks.
(ii) All questions carry equal marks.
(iii) Assume suitable data, if necessary.
(iv) All questions are compulsory

1. Attempt all of the following :

[1×10=10]

- (a) List any *two* Armstrong's axioms.
- (b) State the different levels of security.
- (c) Define authorization matrix.
- (d) Draw the state diagram of transaction.
- (e) Define the term polyinstantiation.
- (f) What is lost update problem ?
- (g) What do you mean by trigger ?
- (h) Write purpose and syntax of raise statement.
- (i) What is locking ?
- (j) Give any *two* advantages of two-tire architecture.

P.T.O.

2. Attempt any *two* of the following : [2×5=10]

- (a) Explain wait-die and wound-wait deadlock prevention scheme.
- (b) Explain role of DBA with respect to security.
- (c) Explain desirable properties of decomposition.

3. Attempt any *two* of the following : [5×2=10]

- (a) Explain client-server architecture benefits.
- (b) Consider the following relation schema :

student(sno, sname)

teacher (tno, tname, qualification)

Student and teacher are related with many-many relationship.

Write a cursor to list details of students who have taken RDBMS as a subject.

- (c) The following is a list of events in an interleaved execution of set of transactions T1, T2, T3, T4 with two phase locking protocol :

Time	Transaction	Code
t1	T1	LOCK(A, S)
t2	T2	LOCK(B, X)
t3	T3	LOCK(C, X)
t4	T4	LOCK(A, S)

t5	T1	LOCK(C, X)
t6	T2	LOCK(A, S)
t7	T3	LOCK(D, X)
t8	T4	LOCK(B, S)

Construct wait for graph according to above request. Is there deadlock at any instance ? Justify.

4. Attempt (A) or (B) : [1×10=10]

(A) (a) Differentiate between discretionary and mandatory access control method. [5]

(b) Discuss how the recovery from catastrophic failure is handled. [3]

(c) Explain referential integrity. [2]

Or

(B) (a) The following are log entries at the time of system crash : [5]

[Start-transaction, T1]

[Read-item, T1, D]

[Write-item, T1, D, B]

[Commit, T1]

[Checkpoint]

[Start-transaction, T2]

[Read-item, T2, B]

[Write-item, T2, B, 12]

[Start-transaction, T3]

[Write-item, T3, A, 20]

[Read-item, T3, D]

[Write-item, T3, D, 20] ← system crash.

If differed update with checkpoint is used, what will be the recovery procedure ?

- (b) Explain time-stamp based protocol with read-write conflicting conditions. [3]
- (c) Explain concatenation of strings in PQ/SQL. [2]

Total No. of Questions—4]

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[5116]-103

S.Y. B.Sc. (Computer Science) EXAMINATION, 2017

MATHEMATICS

Paper I

[(MTC-211) Applied Algebra]

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Use of single memory, non-programmable, scientific calculator is allowed.

1. Attempt any *five* of the following : [10]

(i) Define basis of a vector space. What is the standard basis of the vector space $M_{2 \times 2}(\mathbf{R})$?

(ii) Find the value of k for which the vector $(1, -2, k)$ is a linear combination of the vectors $(1, 0, -2)$ and $(1, -1, -3)$.

(iii) If $T : \mathbf{R}^3 \rightarrow \mathbf{R}^2$ is a linear transformation defined as :

$$T(x, y, z) = (x + y - z, x + 2y + 3z),$$

find the standard matrix of T .

P.T.O.

(iv) If $T : \mathbf{R}^3 \rightarrow \mathbf{R}^2$ is a linear transformation defined as :

$$T(x, y, z) = (x + 6y - 2z, 2x - 4y + z)$$

then show that the vector $V = (6, 15, 48)$ is in $\text{Ker}(T)$.

(v) Find the symmetric matrix A such that the quadratic form :

$$f(x, y, z) = 2x^2 + 3y^2 - z^2 - 10xy + 4xz + 6yz$$

is expressed in the form X^tAX .

(vi) If 'e' is a (2, 5) encoding function with minimum distance 3, then how many errors can this code detect ? How many errors can it correct ?

(vii) Define weight of a word. Find the Hamming distance between the words $x = 10101111$ and $y = 01100110$.

2. Attempt any *two* of the following : [10]

(i) Show that the set :

$$W = \left\{ \left[\begin{array}{cc} a & 0 \\ 0 & b \end{array} \right] / a, b \in \mathbf{R} \right\}$$

is a subspace of vector space, $V = M_{2 \times 2}(\mathbf{R})$

(ii) Show that the set of vectors $v_1 = (1, 2, 3, 4)$, $v_2 = (0, 1, 0, -1)$ and $v_3 = (1, 3, 3, 3)$ form a linearly dependent set in \mathbf{R}^4 .

(iii) Find a basis for the row space of the matrix :

$$A = \begin{bmatrix} 1 & -2 & 0 & 0 & 3 \\ 2 & -5 & -3 & -2 & 6 \\ 0 & 5 & 15 & 10 & 0 \\ 2 & 6 & 18 & 8 & 6 \end{bmatrix}$$

Hence find rank (A) and nullity (A).

3. Attempt any *two* of the following : [10]

(i) Find all eigen values and all eigen vectors of the matrix :

$$A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$$

(ii) Define transformation $T: \mathbf{R}^2 \rightarrow \mathbf{R}^3$ as :

$$T(x, y) = (x + y, 3xy, x^2 - y^2)$$

show that T is not a linear transformation.

(iii) If :

$$G = (\mathbf{Z}_4, t_4) \text{ and } H = \{\bar{0}, \bar{2}\}.$$

Write all left cosets of subgroup H in group G . Show that G/H is a group.

4. Attempt any *one* of the following : [10]

(i) (a) Find the maximum and minimum values of the quadratic form :

$$x_1^2 + x_2^2 + 4x_1 x_2$$

Subject to the constraint $x_1^2 + x_2^2 = 1$. Also determine the values of x_1 and x_2 at which the maximum and minimum occur.

(b) Use R.S.A. method with pairs of letters and $p = 19$, $q = 23$, $s = 41$ to encode the message word "GO".

(ii) (a) If $T : V \rightarrow W$ is a linear transformation, then show that $\ker(T)$ is a subspace of V and $\text{Range}(T)$ is a subspace of W .

(b) If :

$$H = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

is a parity check matrix, determine the code $e_H : \mathbb{B}^2 \rightarrow \mathbb{B}^5$. Show that it is a group code. Find the minimum distance.

Total No. of Questions—4]

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[5116]-104

S.Y. B.Sc. (Computer Science) (First Sem.) EXAMINATION, 2017

MATHEMATICS

Paper II

(MTC-212 : Numerical Analysis)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—** (i) *All* questions are compulsory.
(ii) Figures to the right indicate full marks.
(iii) Use of single memory, non-programmable, scientific calculator is allowed.

1. Attempt any *five* of the following : [5×2=10]
- (i) Using False position method, find a real root of the equation $x^2 - \log x - 12 = 0$ in the interval (3, 4). (Perform one iteration)
- (ii) If the number $\frac{2}{3}$ is represented approximately as 0.6666, find the absolute and relative error.
- (iii) Write Simpson's $\frac{3}{8}$ th rule for numerical integration.

P.T.O.

(iv) Solve :

$$\frac{dy}{dx} = (x + y)^2; y(0) = 1.$$

Find $y(0.1)$ using Euler's method.

(v) State Bessel's interpolation formula.

(vi) Find missing term in the following table using shift operator E :

x	y
0	1
1	2
2	6
3	?
4	51

(vii) Evaluate :

$$\left(\frac{\Delta^2}{E} \right) x^2 \text{ (Take } h = 1).$$

2. Attempt any *two* of the following : [2×5=10]

(i) Derive Newton's forward interpolation formula.

(ii) Evaluate $y(1.3)$ using Newton's divided difference formula :

x	y
0	1
2	13
3	34
4	73
6	229

(iii) Find a real root of the equation $x^4 - x - 10 = 0$ using Newton-Raphson method. Take initial value $x_0 = 2$. (Perform three iterations)

3. Attempt any *two* of the following : [2×5=10]

(i) Derive the general quadrature formula for numerical integration.

(ii) Using Lagrange's interpolation formula, find the polynomial $y = f(x)$ such that $f(1) = 1$, $f(3) = 27$, $f(4) = 64$.

(iii) Evaluate the integral :

$$\int_0^2 \frac{1}{x^2 + x + 1} dx,$$

using trapezoidal rule. (Take $h = 0.25$)

4. Attempt any *one* of the following : [1×10=10]

(i) (a) Use Runge-Kutta method of fourth order to compute $y(0.2)$.

Given that :

$$\frac{dy}{dx} = 1 + y^2, \quad y(0) = 0. \quad (\text{Take } h = 0.2)$$

(b) With usual notation, prove that :

$$\mu\delta = \frac{1}{2}(\Delta + \nabla) \text{ and}$$

$$hD = -\log(1 - \nabla).$$

- (ii) (a) Using modified Euler's method, find the value of y at $x = 0.1$ with $h = 0.1$, where :

$$\frac{dy}{dx} = 1 - y, \text{ with } y(0) = 0.$$

- (b) From the following table, estimate $\tan(0.29)$ using Newton's backward difference formula :

x	$y = \tan x$
0.20	1.6596
0.22	1.6698
0.24	1.6804
0.26	1.6912
0.28	1.7024
0.30	1.7139

Total No. of Questions—4]

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[5116]-105

S.Y. B.Sc. (Computer Science) (Sem. I) EXAMINATION, 2017

ELECTRONICS

Paper I

(ELC-211 : Digital System Hardware)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagram must be drawn whenever necessary.

1. Answer the following in *one* or *two* sentences each : [10×1=10]

(a) State the size of instruction queue in 8086 microprocessor.

(b) How many minimum number of flip-flops are required to generate the sequence of 0, 2, 5, 4, 8, 7, 0 ?

(c) Define 'Storage Capacity' of memory.

(d) Draw frame structure of Serial Asynchronous data transfer.

(e) Convert the Binary number (1010) to Gray Code.

(f) What is data bus width size of 80486 microprocessor ?

(g) Name any *two* cache memory mapping techniques.

(h) What is UART ?

P.T.O.

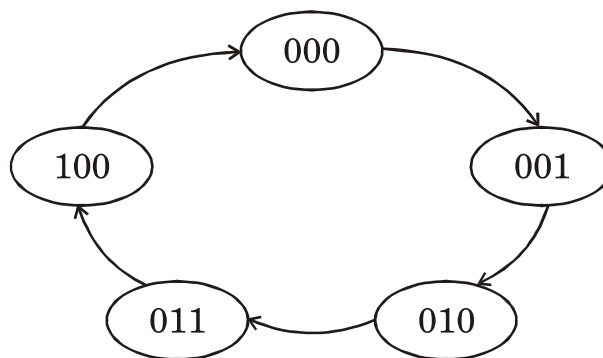
- (i) What is need of interface unit in input/output (I/O) organization ?
- (j) State seven segment decoder output for segments (*a* to *g*) to represent decimal number 2 on common cathode seven segment display.

2. Attempt any *two* of the following : [2×5=10]

- (a) Explain paging technique of virtual memory mapping.
- (b) Draw and explain the internal block diagram of DMA controller.
- (c) Differentiate between Von-Neumann and Harvard Architecture.

3. Attempt any *two* of the following : [2×5=10]

- (a) Design the Random sequence generator for given state diagram using JK flip-flop.



- (b) Explain RS-232 serial communication interface.
- (c) What is need of cache memory ? Also calculate the average access time if bit ratio is 95%, cache memory access time is 200 n sec and main memory access time is 1000 n sec.

4. Attempt any *one* of the following : [1×10=10]

- (a) (i) Design ROM memory of (4K × 8) using available ROM memory chip of (1K × 8).
- (ii) What is priority interrupt ? Explain parallel priority interrupt.

Or

- (b) (i) Draw the circuit diagram of Decimal to BCD encoder (converter) and explain its working.
- (ii) Explain the function of flags in the flag register of 8086 microprocessor.

Total No. of Questions—4]

[Total No. of Printed Pages—3

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[5116]-106

S.Y. B.Sc. (Computer Science)
(First Semester) EXAMINATION, 2017
ELECTRONICS
Paper II
(ELC-212 Analog Systems)
(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Answer all of the following in *one* or *two* sentences : [10×1=10]
- (a) Define the term 'Conversion time' with respect to ADC.
 - (b) For first order low pass filter calculate the cutoff frequency, if $R = 10 \text{ k ohm}$ and $C = 0.001 \text{ microfarad}$.
 - (c) Give any *two* examples of optical sensor.
 - (d) Define the term active sensor.
 - (e) Find output current of AD 590 at 300 degree Kelvin temperature.
 - (f) What is the use of Wheatstone's bridge circuit in signal conditioning ?

P.T.O.

- (g) Draw circuit diagram of op-amp as inverting amplifier.
- (h) What is advantage of R-2R ladder DAC over binary weighted resistor DAC ?
- (i) Write any *two* features of LM35.
- (j) State any *two* applications of tilt sensor.

2. Attempt any *two* of the following : [2×5=10]

- (a) Draw the circuit diagram of level shifter circuit and explain its working.
- (b) With suitable diagram explain operating principle of LVDT.
- (c) Draw circuit diagram of 4-bit R-2R ladder network DAC.

For a 4-bit R-2R ladder assume '0' = 0 volt and '1' = + 16 volts.

Find :

- (i) Full scale analog voltage.
- (ii) Analog voltage for 1011 digital input.
- (iii) Analog voltage due to LSB change.

3. Attempt any *two* of the following : [2×5=10]

- (a) Write the comparison between passive and active filters based on any *five* points.
- (b) Explain block diagram of intruder detector system using PIR sensor.
- (c) With neat block diagram explain the piezoelectric humidity sensor.

4. Attempt any *one* of the following : [1×10=10]

- (a) (i) Explain the block diagram of analog electronic system.
- (ii) Draw circuit diagram of op-amp based voltage to frequency converter (VFC) and explain its working.

Or

- (b) (i) Explain the working of successive approximation ADC with neat diagram.
- (ii) Draw simplified block diagram of ECG and explain its working.

Total No. of Questions—4+4]

[Total No. of Printed Pages—6

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[5116]-107

S.Y. B.Sc. (Computer Science) (First Semester)

EXAMINATION, 2017

TECHNICAL ENGLISH

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory

(ii) Figures to the right indicate full marks.

1. (A) Attempt any *one* of the following in about **100** words : [5]
 - (i) Describe the importance of the sun for all life on the earth.
 - (ii) Write a short note on stars.
- (B) Attempt any *one* of the following in about **100** words : [5]
 - (i) State how the pre-Christian attitude to disease is contrasted with that of the scientist in the scientific point of view ?
 - (ii) How has the development in the science of medicine helped civilization ?
2. (A) Attempt any *one* of the following in about **100** words : [5]
 - (i) Write a short note on television as Babysitter.
 - (ii) Shame and sin become a part of a girl's identity along with the Purdah. How does the poem depict this idea ?

P.T.O.

- (B) Attempt any *one* of the following in about **100** words : [5]
- (i) Describe the central theme of the poem ‘*Purdah*’.
- (ii) How does the writer explain the virtues and value of life in the poem ‘A Pslam of Life’ ?
- 3.** (A) Write antonyms of the following words : [5]
- (i) Major
- (ii) Urban
- (iii) Success
- (iv) Honest
- (v) Possible.
- (B) Combine words from ‘A’ and ‘B’ to form commonly used collocation : [5]
- | ‘A’ | ‘B’ |
|--------------------|---------|
| (i) Beauty | Company |
| (ii) Multinational | Contest |
| (iii) Incurable | Offer |
| (iv) Free | Address |
| (v) Website | Disease |
- 4.** (A) Fill in the blanks with appropriate tense forms of verbs given in bracket : [5]
- (i) They (talk) to each other.
(Present progressive tense)
- (ii) The boys (go) to school.
(Present perfect tense)
- (iii) Mahesh (play) tennis for the last two hours.
(Present perfect progressive tense)
- (iv) The postman (deliver) the letter this morning.
(Simple past tense)
- (v) I (write) to him next week.
(Simple future tense)

(B) Do as directed : [5]

(i) We searched everywhere for the key but could not find it.

(Change it into complex sentence)

(ii) Although the curry was too salty, Amit did not complain.

(Change it into simple sentence)

(iii) Even though we missed the bus, we got to the office on time.

(Change it into compound sentence)

(iv) Open the door.

(Change it into declarative sentence)

(v) We had an exciting trip.

(Change it into exclamatory sentence)

(Backlog)

Time : Two Hours

Maximum Marks : 40

N.B. :- (i) All questions are compulsory

(ii) Figures to the right indicate full marks.

1. (A) Attempt any *one* of the following in about **100** words : [5]
 - (i) Write a short note on Venus and Jupiter.
 - (ii) Describe the interesting information about the stars.
- (B) Attempt any *one* of the following in about **100** words : [5]
 - (i) How does the scientific point of view play the role in problem of African-American and American Civil War ?
 - (ii) What are the effects of scientific discoveries in the field of medicine ?

2. (A) Attempt any *one* of the following in about **100** words : [5]
 - (i) Why does author say that television is ill-equipped for the child to face the reality of life ?
 - (ii) Explain the television as baby sitter briefly.
- (B) Attempt any *one* of the following in about **100** words : [5]
 - (i) What is the significance of the little box that Rosemary wanted to buy ?
 - (ii) How did the narrator react to changes made to his features in the photograph ?

3. (A) Combine words from 'A' and 'B' to form compound word : [5]

'A'	'B'
(i) brain	look
(ii) earth	wash
(iii) over	quake
(iv) water	clean
(v) dry	proof

(B) Fill in the blanks in the sentences adding the following prefixes and suffixes to the words given in brackets : [5]

(-ment, -less, -y, un-, pre-)

- (i) The pain has become (tolerable)
- (ii) It is very day. (wind)
- (iii) I have a card. (pre)
- (iv) You are about how to get to the station, aren't you ? (clue)
- (v) There has been a great deal of here since the 1970. (develop)

4. (A) Do as directed : [5]

(i) Shah said, "My mother will leave tomorrow.

(Change it into indirect speech)

(ii) Film division is making a documentary on the white tiger.

(Change the voice)

(iii) He plays cricket.

(Change it into interrogative sentence)

(iv) It is a very wonderful performance.

(Change it into an exclamatory sentence)

(v) Tell me your address.

(Change it into complex sentence)

(B) Fill in the blanks with the tense forms of the verbs given in brackets : [5]

(i) Let us hope they (learn) English.

(Simple future tense)

(ii) He told me that he (try) to contact me for the past two days.

(Past perfect progressive tense)

(iii) He went to bed after he (lock) the front door.

(The past perfect tense)

(iv) They (make) films for thirteen years.

(The present perfect progressive tense)

(v) I (start) a new business next year.

(The present progressive tense)

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-201

S.Y. B.Sc. (Second Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper-I

(CS-221 : Object Oriented Concepts Using C++)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) *All* questions carry equal marks.

(iii) Assume suitable data if necessary.

(iv) Figures to the right indicate full marks.

1. Attempt *all* of the following : [10×1=10]

(a) What is the difference between inline function and macros ?

(b) Write the syntax of constructor in derived class.

(c) A function can be declared as private. State True/False.

(d) Which stream is used to input values to variables in the program ?

(e) List the C++ operators that cannot be overloaded.

(f) What does catch (...) mean ?

P.T.O.

- (g) Write *one* advantage of using Templates.
- (h) Which header file is used for manipulators ?
- (i) Which functions are used to read and write characters to a file ?
- (j) State any *two* advantages of OOP.

2. Attempt any *two* of the following : [2×5=10]

- (a) What is copy constructor ? What is its purpose ? Explain with example.
- (b) Explain how run time polymorphism is achieved in C++. Explain with example.
- (c) Write a program using operator overloading to overload the << and >> operators for class Date. The data members of Date class are DD, MM, YY. Write necessary constructors. Create '*n*' objects of Date class and display them in suitable format.

3. Attempt any *two* of the following : [2×5=10]

- (a) Write a C++ program to accept the eno, ename, esalary and ebonus for five employees.
Calculate total salary and display the output.
- (b) Write a program to demonstrate the concept of rethrowing an exception.
- (c) Explain scope resolution operator with uses and example.

4. Attempt any *one* of the following (A or B) : [1×10=10]

(A) (i) Write a C++ program to merge two files into one file. [5]

(ii) Explain the rules of operator overloading. [5]

Or

(B) (i) Explain the ways of opening a file in C++. [2]

(ii) What is the output of the following program ?
(Assume there are no syntax errors) : [3]

```
# include < iostream.h >

void stat( )
}

    int m = 0;

    static int n = 0;

    m++;

    n++;

    cout<<m<<n<< " " <<n<< "\n";

}

int main( )
}

    stat( );

    stat( );

    return 0;

}
```

- (iii) Write a program to prepare marksheet of the college examination with the following items read from the keyboard :
Student name, roll no, subject name, subject code, internal marks, external marks. Design the base class consisting of data members such as student name, roll no, subject name. The derived class consists of members, viz, subject code, internal and external marks. [5]

Total No. of Questions—4]

[Total No. of Printed Pages—2

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[5116]-202

S.Y. B.Sc. (Sem. II) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

CS : 222 : Software Engineering

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) *All* questions carry equal marks.

1. Attempt *all* of the following : [10×1=10]

(a) What are the different tools of data flow analysis ?

(b) What do you mean by request approval ?

(c) List any *two* advantages of data flow analysis.

(d) What is spike solution ?

(e) List the benefits of MIS.

(f) List the activities of spiral model.

(g) What is elaboration ?

(h) What is unit testing ?

(i) Software is customized. Justify true/false.

(j) List the fact finding techniques.

P.T.O.

- 2.** Attempt any *two* of the following : [2×5=10]
- (a) Explain concurrent development model.
 - (b) Write short note on elements of the system.
 - (c) Explain prototype model in detail.
- 3.** Attempt any *two* of the following : [2×5=10]
- (a) Explain the key XP activities.
 - (b) Explain coding and system implementation of the system development life-cycle.
 - (c) Explain umbrella activities of Software Engineering.
- 4.** Attempt the following : [2×5=10]
- (a) Explain elaboration and specification of Requirements Engineering.
- Or*
- (b) What is an agile process ? Explain any *five* principles to achieve agility.
 - (c) Draw context level, first level DFD for bus reservation system.

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-203

S.Y. B.Sc. (Computer Science) (Second Semester)

EXAMINATION, 2017

MATHEMATICS

Paper I

(MTC-221 : Computational Geometry)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—**
- (i) All questions are compulsory.
 - (ii) Figures to the right indicate full marks.
 - (iii) Use of single memory, non-programmable scientific calculator is allowed.

1. Attempt any *five* of the following : [10]
- (a) Write the 2×2 transformation matrix [T] for reflection through the line $y = -x$. Apply it on the point $P[-2 \ 5]$.
 - (b) Find the point of intersection at infinity for the lines :
$$x + y = 5 \text{ and}$$
$$2x + 2y = 4.$$
 - (c) Write the 3×3 transformation matrix for shearing in z direction proportional to x and y co-ordinates by 12 and 14 units respectively.

P.T.O.

- (d) Define control points.
- (e) What are the types of oblique projection ?
- (f) Determine the increment in angle θ to generate equally spaced 11 points on the arc of the circle,

$$x^2 + y^2 = 25$$

in second quadrant.

- (g) State any *two* properties of Bezier curve.

2. Attempt any *two* of the following : [10]

- (a) If the ΔABC with vertices A[3 4], B[1 1] and C[6 1] is first reflected through X-axis and then uniformly scaled by 10 units, then find the area of the resulting $\Delta A^x B^x C^x$.
- (b) Find the combined transformation matrix [T] for the following sequence of transformations :

- (i) Rotation about the origin through 120° .
- (ii) Reflection through the origin.
- (iii) Shearing in Y-direction by 2 units.

Apply it on the point P[14 17].

- (c) If the line

$$y = mx + k$$

is transformed to the line

$$y^x = m^x x^x + k^x$$

under a 2×2 transformation matrix

$$[T] = \begin{bmatrix} a & b \\ c & d \end{bmatrix},$$

then prove that :

$$k^x = \frac{k(ad - bc)}{a + cm}.$$

3. Attempt any *two* of the following : [10]

(a) Derive the expression for the angles ϕ and θ in dimetric projection.

(b) Obtain the concatenated transformation matrix $[T]$ for the following sequence of transformations :

(i) Translation in x , y and z directions by 5, 10 and 15 units respectively.

(ii) Perspective projection with the centre of projection at $x_c = 4$ on x -axis.

(iii) Scaling in y -coordinate by 3 units.

Apply it on the origin $O[0 \ 0 \ 0]$.

(c) Find the angles of rotation about x -axis and y -axis so that the plane

$$x + 2y + 2z = 0$$

coincides with the $z = 0$ plane.

4. Attempt any *one* of the following : [10]

(a) (i) Write the parametric equation of the Bezier curve with the control points

$$B_0[-1 \ 1], B_1[0 \ 4], B_2[3 \ 4] \text{ and } B_3[3 \ 1].$$

Hence find $P(0.18)$ and $P(0.27)$.

(ii) Develop the rear view and bottom view of the object :

$$[X] = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 1 & 1 \end{bmatrix}.$$

(b) Generate equally spaced 4 points on the parabolic segment in the second quadrant of the parabola,

$$y^2 = -16x$$

for $-4 \leq x \leq -1$.

Total No. of Questions—4]

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[5116]-204

S.Y. B.Sc. (Computer Science) (II Sem.) EXAMINATION, 2017

MATHEMATICS

Paper II

(MTC-222 : Operations Research)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—**
- (i) All questions are compulsory.
 - (ii) Figures to the right indicate full marks.
 - (iii) Use of single memory, non-programmable, scientific calculator is allowed.

1. Attempt any *five* of the following : [10]

- (i) Write any *two* applications of L.P.P.
- (ii) Explain degeneracy in the transportation problem. How can it be resolved ?
- (iii) Determine the saddle point of the following game :

		Player B			
		1	2	3	4
Player A	1	8	6	2	8
	2	8	9	4	5
	3	7	5	3	5

P.T.O.

(iv) Convert the following L.P.P. into standard form :

Maximize : $Z = 3x_1 + x_2 - x_3$

Subject to : $x_1 - x_2 + 3x_3 \geq 0$

$2x_1 - x_2 + 2x_3 = 2$

$-x_1 + 2x_2 + 2x_3 \leq 1$

$x_1, x_2, x_3 \geq 0$

(v) Solve the following assignment problem :

	I	II	III
A	6	4	5
B	2	11	4
C	13	8	3

(vi) Find graphical solution of the following L.P.P., if it exists :

Maximize : $Z = 3x_1 + 5x_2$

Subject to : $x_1 + x_2 \leq 2$

$2x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

(vii) Obtain the IBFS for the following transportation problem by north-west corner method :

		Warehouses			
		W₁	W₂	W₃	Supply
Origins	F₁	16	20	12	200
	F₂	14	8	18	160
	F₃	26	24	16	90
Demand		180	120	150	

2. Attempt any *two* of the following : [10]

(i) Solve the assignment problem to maximize the total profit :

		Machines			
		A	B	C	D
Jobs	I	3	6	2	6
	II	7	1	4	4
	III	3	8	5	8
	IV	6	4	3	7
	V	5	2	4	3
	VI	3	7	8	4

(ii) Solve the following L.P.P. by Simplex method :

Maximize : $Z = 7x_1 + 5x_2$

Subject to : $x_1 + 2x_2 \leq 6$

$4x_1 + 3x_2 \leq 12$

$x_1, x_2 \geq 0$

(iii) Explain Vogel's Approximation method to find IBFS of the transportation problem.

3. Attempt any *two* of the following : [10]

(i) Solve the following game by the dominance principle :

		Player B			
		1	2	3	4
Player A	1	-2	5	0	-3
	2	1	0	3	-1
	3	-3	2	-1	-5
	4	4	4	1	-2

(ii) Solve the following assignment problem :

		Jobs				
		I	II	III	IV	V
Persons	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

(iii) Solve the following L.P.P. by graphical method :

Maximize : $Z = 4x + 3y$

Subject to :

$$4x + 3y \leq 24$$

$$y \leq 6$$

$$x \leq 4.5$$

$$x \geq 0, y \geq 0$$

4. Attempt any *one* of the following : [10]

(i) Find IBFS by north-west corner method. Obtain the optimal solution by MODI method of the following transportation problem :

		Destinations				
		D₁	D₂	D₃	D₄	Supply
Origins	O₁	10	2	20	11	15
	O₂	12	7	9	20	25
	O₃	4	14	16	18	10
	Demand	5	15	15	15	

(ii) Write the dual of the following L.P.P. Using Simplex method solve this dual and hence write the solution of the primal problem :

$$\text{Minimize :} \quad Z = 10x_1 + 8x_2$$

$$\text{Subject to :} \quad x_1 + 2x_2 \geq 5$$

$$2x_1 - x_2 \geq 12$$

$$x_1 + 3x_2 \geq 4$$

$$x_1 \geq 0, x_2 \text{ unrestricted}$$

Total No. of Questions—4]

[Total No. of Printed Pages—3

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[5116]-205

S.Y. B.Sc. (Computer Science) (Second Semester)

EXAMINATION, 2017

ELECTRONICS SCIENCE

Paper I

**(ELC-221 : The 8051 Architecture, Interfacing and
Programming)**

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Use of scientific calculator is allowed.

1. Answer the following in *one* or *two* sentences : [10×1=10]

(a) What is the value of program counter after power on reset ?

(b) Give *two* unconditional jump instructions with proper syntax.

(c) What is the step size of 8-bit ADC, if $V_{ref} = 2.56$ V.

(d) Which pin of LCD is used for controlling the contrast ?

(e) What is the difference between instructions MOV R1, 41H and MOV R1, # 41H ?

P.T.O.

- (f) What is the function of INC and DPTR instruction ?
- (g) State the role of C/\bar{T} bit in TMOD register.
- (h) What is the significance of timer flag (TF) in 8051 ?
- (i) What is size of on chip RAM in 8051 ?
- (j) Give the use of SMOD bit in PCON register.

2. Attempt any *two* of the following : [2×5=10]

- (a) Differentiate between microprocessor and microcontroller.
- (b) Draw a schematic to show how a DAC can be interfaced to 8051. Write a 'C' program to generate a sawtooth waveform.
- (c) Explain the function of the following instructions :
 - (i) MOV A, @ RO
 - (ii) ADD A, # 80H
 - (iii) RL A
 - (iv) SWAP A
 - (v) CPL bit.

3. Attempt any *two* of the following : [2×5=10]

- (a) Explain different addressing modes of 8051 microcontroller with suitable example.
- (b) Write a C program to generate a 5 kHz square wave of 50% duty cycle on port P2.2 line using timer 1, mode 1. Assume crystal frequency = 11.0592 MHz.
- (c) Explain RAM memory space allocation in 8051.

4. Attempt any *one* of the following : [1×10=10]
- (A) (a) Draw bit format of IE register and explain function of each bit. [5]
- (b) List any *three* features of PIC microcontroller. [3]
- (c) Write an assembly language program to toggle all pins of Port 2 continuously. [2]

Or

- (B) (a) Give differences between asynchronous and synchronous serial communication. [5]
- (b) Draw a schematic to show how stepper motor can be interfaced to 8051 microcontroller. [3]
- (c) Explain dual role of Port 0 and port 2 of 8051 microcontroller. [2]

Total No. of Questions—4]

[Total No. of Printed Pages—2

Seat No.	
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[5116]-206

S.Y. B.Sc. (Computer Science) (Second Semester)

EXAMINATION, 2017

ELECTRONIC SCIENCE

Paper II

(ELC-222 : Communication Principle)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—** (i) *All* questions are compulsory.
(ii) Figures to the right indicate full marks.
(iii) Neat diagrams must be drawn wherever necessary.

- 1.** Answer the following in *one or two* sentences : [10×1=10]
- (a) Define Radiation pattern for an antenna.
 - (b) Give any *two* examples of Simplex Communication System.
 - (c) Draw frequency spectrum of AM.
 - (d) State any *two* advantages of Delta modulation over PCM system.
 - (e) Define Dwell time for FHSS.
 - (f) Write down any *two* features of GPRS.
 - (g) Draw waveform of ASK for binary data 11010110.
 - (h) Write the full form of DSSS.
 - (i) What do you understand by Broadband Signal ?
 - (j) Define S/N Ratio.
- 2.** Attempt any *two* of the following : [2×5=10]
- (a) With neat block diagram explain PAM.

P.T.O.

- (b) What are error correcting codes in communication ? Construct Hamming code for data information 1011 transmission with even parity.
- (c) State important features of CDMA.
- 3.** Attempt any *two* of the following : [2×5=10]
- (a) With neat block diagram explain FSK (MODEM) Transmitter and Receiver.
- (b) Explain the concept of TDM.
- (c) Explain the concept of cellular system and handover concept with reference to mobile communication.
- 4.** Attempt any *one* of the following : [1×10=10]
- (a) Explain communication based on direction of transmission modes with example of each.
- (b) Explain the function of elements used in RFID technology.
- Or*
- (a) Differentiate between AM and FM.
- (b) With neat block diagram explain the FHSS.

Total No. of Questions—4+4]

[Total No. of Printed Pages—5

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[5116]-207

S.Y. B.Sc. (Computer Science) (Second Semester)

EXAMINATION, 2017

ENGLISH

(Technical English)

(New & Old Course)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) Figures to the right indicate full marks.

1. (A) Attempt any *one* of the following in about **100** words : [5]
- (a) Describe the first meeting of Rosemary Fell with the poor girl.
- (b) How does the photographer explain the changes made by him to the writer ?
- (B) Attempt any *one* of the following in about **100** words : [5]
- (a) Describe the conversation between the photographer and the writer, when the writer went to take his photograph ?
- (b) Explain the significance of the title of the short story 'A Cup of Tea'.

P.T.O.

2. (A) Attempt any *one* of the following in about **100** words : [5]
- (a) Elaborate the central theme of the poem 'Ozymandias'.
 - (b) Explain the advice given by father to his son in the poem 'IF' by Rudyard Kipling.
- (B) Attempt any *one* of the following in about **100** words : [5]
- (a) Analyze Wordsworth's attitude to nature, memory and imagination.
 - (b) How does the poet describe the virtues of courage, will power and steadfastness in the poem 'IF' ?
3. Attempt any *two* of the following : [10]
- (a) Write *five* questions that could be asked in an interview for the post of a Software Engineer in a Computer Firm.
 - (b) Ramesh, Sanjay, Kirti and Gopal are given the topic 'The importance of student election in colleges'. Write a transcript of the discussion in a dialogue form.
 - (c) Prepare *five* slides for the PowerPoint presentation on an electronic item that you would like to promote in the market.
 - (d) Write a short note on Group Discussion.

4. Attempt any *two* of the following : [10]

- (a) Write a paragraph on 'Wildlife Conservation'.
- (b) Write an essay on Mass Media and Education.
- (c) Write a review of a film that you saw recently.
- (d) Write a brief report on 'International Film Festival'.

[5116]-207

(Old Course)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

1. (A) Attempt any *one* of the following in about **100** words :[5]

(i) Bring out the literal and figurative meaning of the word 'Purdah' in the poem 'Purdah'.

(ii) 'A Psalm of Life' reads like a prayer of hope, joy and optimism. Explain.

(B) Attempt any *one* of the following in about **100** words :[5]

(i) How does the poem 'Purdah' build the idea that 'Life changes for a girl, once she starts wearing the Purdah'?

(ii) What images of war are present in the poem 'A Psalm of Life' ?

2. (A) Attempt any *one* of the following in about **100** words :[5]

(i) Describe the emotions that still remain on the face of the sculpture in the poem 'Ozymandias'.

(ii) Explain the significance of the title "If" daffodils on the speaker.

(iii) What challenges of life does a person have to face in life according to Rudyard Kipling in the poem 'If'.

- 3.** Attempt any *two* of the following : [10]
- (i) Neha, Mary, Gopal and Arif are given the topic “Impact of Whats App on younger generation”. Write a transcript of discussion in a dialogue form.
 - (ii) Prepare 5 slides to promote a protien drink for small children.
 - (iii) You have applied for the job of a teacher in a school. Write 5 likely questions that will be asked along with their responses.
 - (iv) Give 5 tips for making a good presentation.
- 4.** Attempt any *two* of the following : [10]
- (i) Write a paragraph on ‘Solar Energy’.
 - (ii) Write a report on the Annual Prize Distribution in your college.
 - (iii) Write a Review on a book you have recently read.
 - (iv) Write an essay on “Should Junk food be served in Canteen”.

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-301

T.Y. B.Sc. (Third Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper I

(CS-331 Systems Programming)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory.

(ii) Figures to right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

1. Attempt All :

[1×10=10]

- (1) What is expansion time variable ?
- (2) What do you mean by cache memory ?
- (3) Which are the contents of macro definition ?
- (4) Write any *two* system calls used for process control on UNIX.
- (5) “Interpreter can generate a code during interpretation.” State true or false.
- (6) Write tasks performed by operating system under memory management.
- (7) Give any *two* advantages of *p*-code compiler.

P.T.O.

- (8) What is the meaning of the following statement in assembly language ?

TEN DC 10

- (9) “Compiler converts assembly language program into LLL.” State true or false.
- (10) Write types of editor.

2. Attempt any *two* : [2×5=10]

- (a) Generate intermediate code variant I and variant II for the following assembly language program.

Assume standard codes for mnemonics, declarative statements register and directive statements :

```
START          200
READ           A
READ           B
MOVER          AREG = '4'
ADD            AREG B
MOVER          BREG A
SUB            BREG A
MOVEM         BREG C
PRINT          C
STOP
A DS 1
B DS 1
C DS 1
END
```

- (b) Explain semantic macro expansion with example.
- (c) Explain various components of object module with example.

3. Attempt any *two* : [2×5=10]

- (a) What is operating system ? Write functions of operating system.
- (b) What is forward reference problem ? How is it handled in one pass assembler ?
- (c) Explain different data structure used in design of a macro-preprocessor.

4. Attempt either A or B :

- (A) (a) What is editor ? Write need of editor. [4]
- (b) Explain command interpreter. [3]
- (c) Give the usage of each of the following statement with its syntax : [3]
 - (i) LCL
 - (ii) SET
 - (iii) ANOP.

- (B) (a) Explain functions and capabilities of debugger. [4]
- (b) Which are different types of assembly language statement?
Explain with an example. [3]
- (c) Define : [3]
- (i) Loader
- (ii) Translated origin
- (iii) Address sensitive instruction

Total No. of Questions—4]

[Total No. of Printed Pages—4

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[5116]-302

T.Y. B.Sc. (Semester III) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

CS-332 : Theoretical Computer Science (TCS)

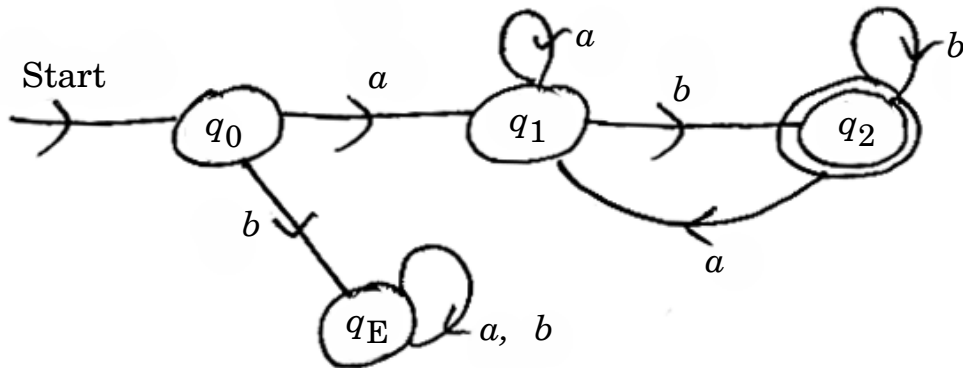
(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :-** (i) All questions are compulsory.
(ii) All questions carry equal marks.
(iii) Figures to the right indicate full marks.

1. Attempt *all* of the following : [10×1=10]
- (a) Define regular expression.
 - (b) Give the mapping of 'δ' function of NFA with ϵ moves.
 - (c) If $A = \{\epsilon\}$. Find the value of $|A|$.
 - (d) Which tool is used to prove that the language is not regular ?
 - (e) Differentiate between Moore and Mealy machine.
 - (f) Give the language accepted by the following FA :



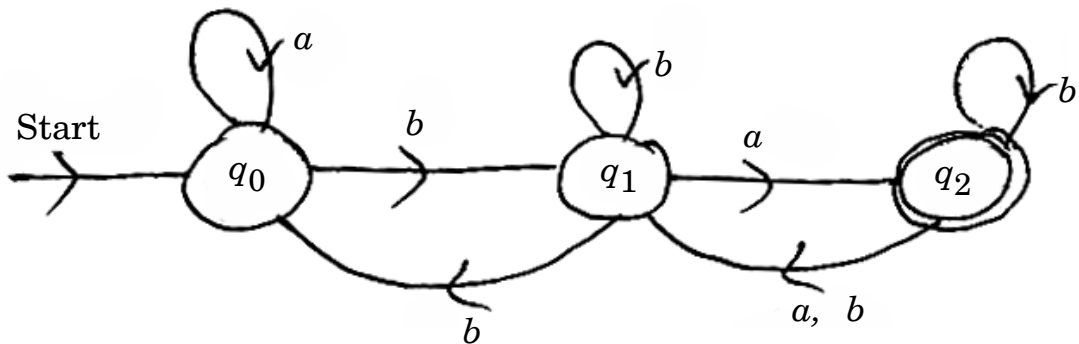
P.T.O.

- (g) Define Kleene Closure.
- (h) Write the tuples of Turing Machine.
- (i) Define ID for PDA.
- (j) Write a language for CFG :

$$S \rightarrow aSa | bSb | a | b | \epsilon.$$

2. Attempt any *two* of the following : [2×5=10]

- (a) Construct a DFA to accept the set of all strings over $\Sigma = \{0, 1, 2\}$ such that the string ends with '012' or '20'.
- (b) Construct a FA for the given RE : $(a^*b + b^*a).ab + ba.b^*$.
- (c) Convert the following given NFA to DFA :



3. Attempt any *two* of the following : [2×5=10]

- (a) (i) Construct CFG for language $L = \{a^n b^m c^m d^n \mid n \geq 1, m \geq 1\}$.
- (ii) Construct CFG for language L which accepts set of all palindromes over $\Sigma = \{a, b\}$.

(b) Rewrite the following CFG after eliminating useless symbols :

$$S \rightarrow 0A0$$

$$A \rightarrow S1|1CC|D0A$$

$$C \rightarrow 011|DD$$

$$E \rightarrow 0C$$

$$D \rightarrow 0DA$$

(c) Construct a TM for $L = \{wcw^R | w \in (a + b)^*\}$.

4. (A) Attempt any *two* of the following : [2×5=10]

(a) Construct a Moore machine for a language L over $\Sigma = \{0, 1\}$ which outputs '\$' if string ends with '100', outputs '#' if string ends with '001', otherwise outputs '*'.

(b) Construct a PDA for $L = \{0^m 1^n 2^n 0^m | m \geq 1, n \geq 1\}$.

(c) (i) Define Recursive language.

(ii) Differentiate between recursive and recursively enumerable languages.

Or

(B) Attempt any *two* of the following : [2×5=10]

(a) Convert the following grammar to GNF :

$$S \rightarrow AB|B$$

$$A \rightarrow BS$$

$$B \rightarrow A1|1$$

(b) Construct PDA equivalent to the given CFG :

$$S \rightarrow aAb \mid aS$$

$$A \rightarrow Bb \mid a$$

$$B \rightarrow Sa \mid b$$

(c) Minimize the following DFA :

$$M = (\{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_7\}, \{0, 1\}, \delta, q_0, \{q_1\})$$

where δ is given by :

δ	0	1
$\rightarrow q_0$	q_4	q_0
$*q_1$	q_1	q_0
q_2	q_1	q_3
q_3	q_7	q_2
q_4	q_0	q_5
q_5	q_1	q_4
q_6	q_7	q_1
q_7	q_3	q_7

Total No. of Questions—4]

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[5116]-303

T.Y. B.Sc. (Sem. III) EXAMINATION, 2017

COMPUTER SCIENCE

Paper III

(CS-333 : Computer Network—I)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All questions are compulsory.*

(ii) *All questions carry equal marks.*

(iii) *Neat diagram must be drawn wherever necessary.*

(iv) *Figures to the right indicate full marks.*

1. Attempt *all* of the following :

[10×1=10]

(a) Define protocol with its key elements.

(b) Define mesh topology.

(c) What is port address ?

(d) List the applications of coaxial cable.

(e) What is the purpose of line testing tool ?

(f) Which devices operate at physical layer ?

(g) Define Bit rate and Baud rate.

P.T.O.

- (h) Which error detection method uses one's complement arithmetic ?
- (i) Define piggybacking.
- (j) State *three* types of MAC protocols.

2. Attempt any *two* of the following : [2×5=10]

- (a) State the difference between LAN and WAN.
- (b) Explain fiber optic cable with their types and applications.
- (c) Calculate the total delay for a frame of size 5 million bits which is sent on a link with 10 Routers, each having queuing time of 2 μ s and a processing time of 1 μ s. The length of the link is 2000 km and speed of light is 2×10^8 m/s in the link. The link has bandwidth 5 Mbps.

3. Attempt any *two* of the following : [2×5=10]

- (a) What are the responsibilities of session and presentation layer ?
- (b) What is parallel transmission ? State their advantages of disadvantages.
- (c) Generate the CRC code for message 1001101010. Give generator polynomial $g(x) = x^4 + x^2 + 1$.

4. Attempt any *one* (A or B) of the following :

- (A) (i) What is framing ? Explain any *two* framing methods with example. [4]
- (ii) Explain FDMA in detail. [4]
- (iii) Using diagram, write the protocol stack of TCP/IP model. [2]

Or

- (B) (i) What are Random access methods ? Explain any *one* mechanism. [4]
- (ii) Write notes on :
- (a) PPP [2]
- (b) Thermal and Induced noise. [2]
- (iii) Explain star topology with their advantages. [2]

Total No. of Questions—4]

[Total No. of Printed Pages—3

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[5116]-304

T.Y. B.Sc. (Computer Science)
(Third Semester) EXAMINATION, 2017
CS-334 : INTERNET PROGRAMMING—I
Paper IV
(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

1. Answer the following : [10×1=10]

(a) State the features of PHP.

(b) What is the use of count() ?

(c) State true or false :

"Include "abc.php" can be written two times in a PHP script."

(d) What is serialization ?

(e) Define array_unique().

(f) Write the output of the following PHP script :

```
$white="show";  
$black=&$while;  
unset($white);  
print$black;
```

P.T.O.

- (g) “A function can have variable number of arguments.” State true or false.
- (h) How to find out the position of the first occurrence of a substring in a string ?
- (i) State the pear db function to get system error message, if the database connection fails.
- (j) How to get the user ID of the owner of the specified file ?
- 2.** Attempt any *two* of the following : [2×5=10]
- (a) Explain the PHP functions used to convert array into variables and vice versa.
- (b) Assume database empdb is already exists. Write a PHP script using postgresQL to increment salary of all employees by 10%. Consider table emp(eno, ename, salary).
- (c) Write a PHP script to accept three strings str1, str2, str3 from user. Search str2 in str1 and replace all occurrences of str2 by str3. Also display total number of occurrences.
- 3.** Attempt any *two* of the following : [2×5=10]
- (a) Write a PHP script to display date and time of a file when it was last accessed.
- (b) How to call a constructor of a parent class from a child class ? Explain with suitable example.
- (c) Write the difference between break and continue statement of PHP with an example.

4. Attempt any *one* (A) or (B) : [10]
- (A) (a) Explain the concept of missing parameters to a function with suitable example. [4]
- (b) Write a PHP script to implement any *two* set operations. eg. union, intersection, difference. [4]
- (c) What is abstract class ? Write features of it. [2]
- (B) (a) Explain the functions used for reading and writing characters in files. [4]
- (b) Discuss PCRE `preg_match()` and `preg_grep()` with example. [4]
- (c) Explain `DB :: connect()`. [2]

Total No. of Questions—4]

[Total No. of Printed Pages—3

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[5116]-305

T.Y. B.Sc. (Third Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper V

(CS-335 : Programming in Java—I)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—**
- (i) *All* questions are compulsory.
 - (ii) Figures to the right indicate full marks.
 - (iii) *All* questions carry equal marks.

1. Attempt *all* of the following : [10×1=10]
- (a) What is Javadoc ?
 - (b) List primitive data types in Java with their width in bits.
 - (c) What is the use of this keyword in Java ?
 - (d) What is AutoBoxing and unboxing ?
 - (e) What is assertion ?
 - (f) What is the use of final keyword ?
 - (g) What is an adapter class ?
 - (h) One interface can implement another interface. True/False—
Justify.
 - (i) List any *four* methods of JButton class.
 - (j) Differentiate '==' and equals().

P.T.O.

2. Attempt any *two* of the following : [2×5=10]
- (a) Why is Java called purely object oriented programming language ? Explain features of Java.
 - (b) Create an abstract class `Order` having members `id` and `description`. Create two subclasses `PurchaseOrder` and `SalesOrder` with member `customer name` and `vendor name` respectively. Define methods `accept` and `display` in all classes. Create 5 objects each of `PurchaseOrder` and `SalesOrder`. `Accept` and `display` details.
 - (c) Write a Java program to accept a file name from command prompt. If the file exists, then display number of words and lines in that file using `FileReader` class.
3. Attempt any *two* of the following : [2×5=10]
- (a) What is wrapper class ? Explain with example.
 - (b) List and describe any *five* methods of `InputStream` class along with their syntax.
 - (c) Explain `JComboBox` class with their constructor and methods.
4. Attempt 'A' or 'B' of the following :
- (A) (a) Write a Java program to accept email address of a user and throw a user defined exception `InvalidEmailException` if it starts with digit or does not contain `@` symbol. [5]

(b) Explain in detail the Applet life cycle with diagram. [3]

(c) Differentiate String and StringBuffer classes. [2]

Or

(B) (a) Write a Java program using AWT to print “Welcome to T.Y. B.Sc. Computer Science” with Times New Roman font face and size is 16 in Red Color. When we click on a button text color should change to Blue. [5]

(b) Explain method overriding with example. [3]

(c) What is Package ? How to create a package ? Give example. [2]

Total No. of Questions—4]

[Total No. of Printed Pages—3

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[5116]-306

T.Y. B.Sc. (Computer Science) (Third Semester)

EXAMINATION, 2017

CS-336 : OBJECT ORIENTED SOFTWARE ENGINEERING

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—** (i) Neat diagrams must be drawn wherever necessary.
(ii) Figures to the right indicate full marks.
(iii) All questions carry equal marks.
(iv) All questions are compulsory

1. Attempt all of the following : [10×1=10]
- (a) Write any *two* benefits of the object oriented programming.
 - (b) Define an object “Saving Account” with possible attributes and operations with visibility.
 - (c) “UML is a pure visual programming language.” State T/F. Justify.
 - (d) Define Association.
 - (e) What is use cases ?
 - (f) Name any *two* phases of Iterative development process.
 - (g) What do you meant by components ?

P.T.O.

- (h) Define Alpha testing.
- (i) "A class is object types." State T/F. Justify.
- (j) What is meant by protected visibility ?
- 2.** Attempt any *two* of the following : [2×5=10]
- (a) Explain elaboration with some key ideas and best practices.
- (b) What is use of deployment diagram ? Explain it with suitable example.
- (c) Differentiate between aggregation and generalization with suitable examples.
- 3.** Attempt any *two* of the following : [2×5=10]
- (a) Write a note on Booch method.
- (b) Define collaboration. Explain structural aspects of a collaboration.
- (c) Prepare a class diagram giving attributes and operations for stack and queue implementation using linked list.
- 4.** Attempt the following :
- (a) Library system of a University is to be computerized. The members can be students, University departments and colleges affiliated to the university. The information about available books should be available with all these members. The student has to return book within 15 days and is charged fine for the delay. Number of books that can be issued to him are restricted

to five. If the books are not available or copies are not available, the member can issue demand requests which are used for procurement of books. Dealers send list of new books, which are categorized according to subject and subjectwise list is then sent to respective department for approval. Approved books are then procured.

Consider the above case and draw the following diagrams :

- (1) Use case diagram. [3]
- (2) Sequence diagram. [4]
- (b) What is integration testing ? Explain role of stub. [3]

Or

Draw component and deployment diagram for e-mail system. [3]

Total No. of Questions—4]

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[5116]-401

T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

(CS-341 : System Prog. and Operating Systems)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—**
- (i) *All* questions are compulsory.
 - (ii) *All* questions carry equal marks.
 - (iii) Neat diagrams must be drawn wherever necessary.

1. Attempt *all* of the following : [10×1=10]
- (a) List any *four* file attributes.
 - (b) What is role of valid and invalid bit in demand paging ?
 - (c) Define Reentrant code.
 - (d) State *two* benefits of multi-threaded programming.
 - (e) What is Aging ?
 - (f) “Counting semaphore can be implemented by using binary semaphore.” True/False Justify.
 - (g) What is race condition ?
 - (h) Define Starvation.
 - (i) List *two* benefits of virtual machine.
 - (j) What is the main function of microkernels ?

P.T.O.

2. Attempt any *two* of the following : [2×5=10]

(a) What is process ? State and explain in brief different types of process states.

(b) Consider the following snapshot of the system :

Process	Burst Time	Arrival Time	Priority
P ₁	10	0	3
P ₂	5	4	0 (high)
P ₃	2	3	1
P ₄	16	5	2
P ₅	8	2	4 (low)

Schedule the above set of processes according to :

(i) Non-preemptive priority scheduling algorithm.

(ii) FCFS.

Draw proper Gantt chart and find average turn around time and average waiting time.

(c) Consider the following snapshot of the system :

	Allocation		
	A	B	C
P ₀	0	1	0
P ₁	2	0	0
P ₂	3	0	2
P ₃	2	1	1
P ₄	0	0	2

Max		
A	B	C
7	5	3
3	2	2
9	0	2
2	2	2
4	3	3

Available		
A	B	C
3	3	2

Answer the following using Banker's algorithm :

- (i) What is content of Need Matrix ?
- (ii) Is the system in a safe state ?

3. Attempt any *two* of the following : [2×5=10]

(a) Consider page reference string as follows :

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 3

Assume 3 frames. Find the number of page faults according to :

- (i) FIFO page replacement algorithm
 - (ii) LRU page replacement algorithm.
- (b) What is deadlock ? Explain deadlock prevention strategies.
- (c) What is critical section problem ? Explain two general approaches to handle critical section in operating system.

4. Attempt any *one* (A or B) : [1×10=10]

(A) (a) Consider the following segment table :

Segment	Base	Length
0	363	500
1	1272	20
2	1675	1500
3	986	240
4	211	130

What are Physical addresses for the following Logical addresses ?

(i) 0,425

(ii) 2,500

(iii) 1,150

(iv) 3,285. [4]

(b) What is external fragmentation ? What are various ways to avoid external fragmentation ? [4]

(c) Explain any *two* benefits of multithreaded programming. [2]

Or

(B) (a) Explain tree structured directories along with advantages and disadvantages. [4]

(b) Explain multilevel feedback queue scheduling with diagram. [4]

(c) What is a wait-for-graph ? [2]

Total No. of Questions—4]

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[5116]-402

T.Y. B.Sc. (CS) (Fourth Semester) EXAMINATION, 2017

CS-342 : COMPILER CONSTRUCTION

Paper II

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions carry equal marks.

(ii) *All* questions are compulsory.

(iii) Figures to the right indicate full marks.

(iv) Neat diagrams must be drawn wherever necessary.

1. Attempt *all* of the following : [10×1=10]

(a) Define synthesized attribute.

(b) What is a basic block ?

(c) Construct LR(0) set of items for the production $A \rightarrow \epsilon$.

(d) Give an expression tree for $(a*b) + ((c*d) * (e+f)) + (c*d)$.

(e) List the *two* aspects of compilation.

(f) What is the output of Lexical Analysis ?

(g) Compute Follow for the following grammar :

$S \rightarrow aABe|bA|\epsilon$ (epsilon)

$A \rightarrow aAb|\epsilon$ (epsilon)

$B \rightarrow bB|c$

P.T.O.

- (h) List the *two* classes of SDD.
- (i) State *one* difference between annotated parse tree and dependency graph.
- (j) State *two* differences between static and dynamic memory allocation.

2. Attempt any *two* of the following : [2×5=10]

- (a) Write a Recursive Decent Parser (RDP) for the following grammar :

$$S \rightarrow aAb|bA$$

$$A \rightarrow Ad|b$$

- (b) Define Directed Acyclic Graph (DAG). Construct DAG for the following expressions :

$$(1) \quad b * (a + c) + (a + c) * d$$

$$(2) \quad y + (y + x)/(x - z) * (x - z).$$

- (c) Write a LEX Program to find the area of a circle. Write the steps to execute the LEX program.

3. Attempt any *two* of the following : [2×5=10]

- (a) Construct Operator Precedence table and find the precedence functions for the following operator grammar :

$$S \rightarrow S-P|P$$

$$P \rightarrow P*R|R$$

$$R \rightarrow id$$

(b) Check whether the given grammar is LL(1) or not :

$$A \rightarrow AaB | x$$

$$B \rightarrow BCb | Cy$$

$$C \rightarrow Ce | \epsilon \text{ (epsilon)}$$

(c) Explain in detail the phases of compilers with the help of a suitable diagram.

4. Attempt any *one* (either A or B) of the following :

(A) (a) Check whether the given grammar is SLR(1) or not : [6]

$$S \rightarrow aAB$$

$$A \rightarrow bA | e$$

$$B \rightarrow bB | a$$

(b) Define annotated parse tree. For the input expression $3*5+4n$, draw an annotated parse tree using the following

SDD : [4]

Production rule

Semantic rule

$$S \rightarrow E$$

$$S.val = E.val$$

$$E \rightarrow E_1 + T$$

$$E.val = E_1.val + T.val$$

$$E \rightarrow T$$

$$E.val = T.val$$

$$T \rightarrow T_1 * F$$

$$T.val = T_1.val \times F.val$$

$$T \rightarrow F$$

$$T.val = F.val$$

$$F \rightarrow \text{digit}$$

$$F.val = \text{digit.lexval}$$

- (B) (a) Construct LALR(1) parsing table and check whether the given grammar is LALR(1) or not : [6]

$$S \rightarrow AaB|B$$

$$A \rightarrow bB|d$$

$$B \rightarrow A|e$$

- (b) What is the use of quadruples over triplets ? Give quadruples representation for the following expression : [4]

$$a+b*c+d*e\hat{f}$$

Total No. of Questions—4]

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[5116]-403

T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper-III

(CS-343 : Computer Networks-II)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions are compulsory.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. Attempt *all* of the following : [10×1=10]
- (a) To identify whether the address is unicast or multicast which bit of the address is considered ?
 - (b) Which standard is used for wireless LAN ?
 - (c) What is the value of HLEN if the size of header is 40 bytes ?
 - (d) How cache memory speeds up ARP operation ?
 - (e) List any *two* features of TCP.
 - (f) What is CGI technology ?

P.T.O.

- (g) What is steganography ?
- (h) What is cipher ?
- (i) What is Generic domain ?
- (j) Find out class, netid and hostid of following :
IP address 126.25.21.1

2. Attempt any *two* of the following : [2×5=10]

- (a) Explain backbone network and its types.
- (b) Distinguish between virtual circuits and datagram subnets.
- (c) Write a short note on SMTP.

3. Attempt any *two* of the following : [2×5=10]

- (a) Explain ARP packet format with suitable diagram.
- (b) Explain the services provided by TCP to application layer.
- (c) Encrypt the following plain text transposition cipher :

Key : MAGNETIC

Plain text : transmit this message

4. Attempt (A) or (B) of the following : [1×10=10]

- (A) (i) Explain the concept of multiplexing and demultiplexing used in process to process delivery. [4]
- (ii) List the advantages of virtual LAN. [4]
- (iii) What is Bluetooth ? Write any *two* advantages of Bluetooth. [2]

Or

(B) (i) For given IP address 205.16.37.39/28 in some block of addresses, calculate : [4]

(a) Address mask

(b) First address of the block

(c) Number of addresses in the block

(d) Last address of the block.

(ii) List and explain the fundamental services offered by DNSec. [4]

(iii) Change the following IPV4 addresses from binary notation to dotted decimal notation : [2]

10000001	00001011	00001011	11101111
11000001	10000011	00011011	11111111

Total No. of Questions—4]

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T.Y. B.Sc. (Computer Science) (Fourth Semester)

EXAMINATION, 2017

CS-344 : INTERNET PROGRAMMING—II

Paper IV

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—** (i) *All* questions are compulsory.
(ii) Figures to the right indicate full marks.
(iii) *All* questions carry equal marks.

1. Answer *All* of the following : [10×1=10]
- (a) What is the advantage of writing JavaScript in an external file ?
 - (b) Differentiate between CC and BCC field from an e-mail Header.
 - (c) State True/False :
“We can have empty XML tags.”
 - (d) What is callback function ?
 - (e) How to get response from XMLHttpRequest object received from server in Ajax ?
 - (f) Which protocol is used to send an e-mail ?
 - (g) Whether root element is required for XML file ? If so, how many root elements are required ?

P.T.O.

(h) What will be the return value for the following JavaScript statement :

`typeof [1, 2, 3, 4] ?`

(i) How to set response header in PHP ?

(j) How to register a variable into a session ?

2. Attempt any *two* of the following : [2×5=10]

(a) What is sticky forms ? Explain with example.

(b) Differentiate between synchronous and asynchronous request to the server in Ajax. Explain with example.

(c) How to send an e-mail in PHP ? Explain with suitable example.

3. Attempt any *two* of the following : [2×5=10]

(a) Write a JavaScript to accept a sentence from user and convert it to an array of words. Also display array element.

(b) Accept cricket player name from user. Write a program to search player name into cricket.xml file and display details (name, runs, wickets) using Ajax (use DOM functions).

(c) Write a PHP script using simple.xml functions to read student.xml file and display information of students whose percentage is greater than 70. The student.xml file contains name, class and percentage.

4. Attempt any *one* (A or B) : [1×10=10]

(A) (a) Explain the concept of session handling with example. [4]

(b) Write a JavaScript function to validate user name and password against hardcoded values. [4]

(c) What is well formed XML document ? [2]

Or

(B) (a) What is the scope of variable in JavaScript ? [4]

(b) Explain self-processing forms with example. [4]

(c) What is an XML schema ? [2]

Total No. of Questions—4]

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T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper-V

(CS-345 : Programming in Java-II)

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

N.B. :— (i) *All* questions carry equal mark.

(ii) Figures to the right indicate full marks.

(iii) *All* questions are compulsory.

1. Attempt *all* of the following :

[10×1=10]

(a) What is collection ?

(b) Which interfaces are implemented by TreeSet class.

(c) What are *four* types of JDBC drivers ?

(d) When to use PreparedStatement ?

(e) What is servlet ?

(f) Write syntax of comments in JSP.

(g) What is purpose of JSP directives ?

(h) State any *two* methods of inner-thread communication.

(i) How do we set priority to thread ?

(j) Define the term socket.

P.T.O.

2. Attempt any *two* of the following : [2×5=10]

- (a) Write a JDBC program to insert following '*n*' records to employee table having structure emp_no, emp_name and salary and display it.
- (b) Explain the purpose of GET and POST method in servlet request. Differentiate between doGet() and doPost() methods.
- (c) Explain thread life-cycle with its methods.

3. Attempt any *two* of the following : [2×5=10]

- (a) What is ResultSet ? Explain scrollable and updatable resultSets.
- (b) Write a servlet program to count the number of times a servlet has been invoked.
- (c) What is JSP ? Explain JSP life-cycle.

4. Attempt any *one* (either A or B) of the following : [1×10=10]

- (A) (i) Explain map interface. Give its implementation. [4]
- (ii) What is cookie ? Explain how cookie can be created and accessed in servlet. [4]
- (iii) What is the use of synchronize keyword. [2]

Or

- (B) (i) What are advantages of JSP ? [4]
- (ii) Explain ServerSocket and SocketClass. Give *two* methods of each class with syntax. [4]
- (iii) State the use of Iterator and List Iterator. [2]

Total No. of Questions—4]

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[5116]-406

T.Y. B.Sc. (Computer Science) (IV Sem.) EXAMINATION, 2017

CS-346 : COMPUTER GRAPHICS

Paper VI

(2013 PATTERN)

Time : Two Hours

Maximum Marks : 40

- N.B. :—**
- (i) All questions are compulsory.
 - (ii) Figures to the right indicate full marks.
 - (iii) Draw neat diagrams wherever necessary.
 - (iv) Use of calculator is allowed.

1. Attempt all of the following :

[10×1=10]

- (a) What is scan conversion ?
- (b) Define Resolution.
- (c) State the purpose of locator.
- (d) What is persistence ?
- (e) List the different methods of circle drawing.
- (f) Give the basic 2-D translation equation.
- (g) List the open GL functions for creating menus in open GL.
- (h) What is raster graphics ?

P.T.O.

- (i) Define clipping.
- (j) Which *two* operations are performed in general parallel projection transformation ?

2. Attempt any *two* of the following : [2×5=10]

- (a) Generate points the line with end points $P_1 = (1, 2)$, $P_2 = (7, 6)$ using Bresenham's line drawing algorithm.
- (b) Calculate final co-ordinate of an object A(0, 0), B(1, 0), C(1, 1) and D(0, 1) rotated by 45° about origin.
- (c) A cube is defined by vertices A(0, 0, 0), B(2, 0, 0), C(2, 2, 0), D(0, 2, 0), E(0, 0, 2), F(0, 2, 2), G(2, 0, 2), H(2, 2, 2). Perform the following transformations on the above cube :
 - (i) Translation ($t_x = 2, t_y = 4, t_z = 0$)
 - (ii) Scaling ($s_x = 0.5, s_y = 1, s_z = 1$).

3. Attempt any *two* of the following : [2×5=10]

- (a) Write the flood fill algorithm. State its drawbacks.
- (b) Write a note on frame buffer.
- (c) Explain midpoint subdivision algorithm.

4. Attempt (A) or (B) :

- (A) (a) Give any *two* functions in open GL which are used for mouse interaction. [2]
- (b) Explain back face detection method with advantages and disadvantages. [4]
- (c) Explain viewing Pipeline in detail. [4]

Or

- (B) (a) What are different echo types for choice device ? [2]
- (b) Explain the cohen sutherland line clipping algorithm. [4]
- (c) State difference between object space method and image space method. [4]