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 reserved word.
(b) State True/False : ‘C’ performs bound checking for an array.
(c) What do you mean by exit control loop.
(d) Give the syntax for ternary operator.
(e) Give the difference between bitwise AND and logical AND.
(f) State properties of Algorithm.

(g) –XYZ is a valid ‘C’ identifier : Comment.

(h) Give the difference between malloc( ) and calloc( ).

(i) State True/False : A macro name must always be written in capital letter.

(j) Which function is used to calculate $\sqrt{x}$ in ‘C’ from math.h library? Give syntax.

2. Answer the following (any four) : [4x5=20]

(i) Explain ‘C’ program development life cycle.

(ii) Write a note on switch statement.

(iii) Explain self-referential structure.

(iv) Explain the following functions with example :

   (a) strrev( )

   (b) strcmp( )

   (c) strlen( )

   (d)strupr( )

   (e) strlwr( )

(v) Explain the following with example :

   (a) Assignment operator
(b) Conditional operator
(c) Comma operator
(d) Type cast operator
(e) Size of operator.

3. Answer the following (any four) : [4x5=20]

(i) Write algorithm and draw a flowchart for sum of digit until one digit.
   (eq : 932; 9 + 3 + 2 = 14; 1 + 4 = 5 = output)
(ii) What will be the output of the following code ? Justify.
    main( )
    {
        int a = 2;
        printf ("%d %d", a, a++);
    }
(iii) What will be the output of the following code ? Justify.
    (a) main( )
    {
        int i;
        i = 0 \times 10 + 010 + 10;
        printf ("%d", i);
    }
(b) main( )
{
    char ch = 'A';
    printf("%d %d", sizeof(ch), sizeof('A'));
}

(iv) Find and justify the output of the following program:
    # include <stdio.h>
    int main( )
    {
        int ***r, j, **q, *p, i = 7;
        p = & i;
        q = & p;
        r = & q;
        printf("%d %d %d \n", *p, **q, ***r);
        return (0);
    }

(v) Find the errors if any, and justify;
    main( )
    {

        float a = 3.5;

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

(i) Write a ‘C’ program to insert number of characters of substring at given position in string.

(eq : s₁ = abcdef, s₂ = pqr, position = 2, o/p = abcpqrdef)

(ii) Write a ‘C’ program to store the information of player with attributes : name, number of innings and total score. Calculate the average score of each player and display information of all players.

(iii) Write a ‘C’ program to reverse the element of an array.

(iv) Write a ‘C’ program to print the following series :

\[ 1 + \frac{1}{x^3} + \frac{1}{x^5} + \frac{1}{x^7} + \ldots \frac{1}{x^n} \]
(v) Write a ‘C’ program to print the following pattern:

```
    1
   1 2
  1 2 3
 1 2 3 4
```

5. Answer the following (any two):

   (i) Write a note on preprocessor.

   (ii) Explain jump statement with example.

   (iii) Explain memory allocation techniques.

[2x5=10]
F.Y. B.Sc. (Computer Science) EXAMINATION, 2017
CS-102 : File Organization and Fundamentals of Databases
Paper 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) 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 a physical file ?
   (b) State any two functions of DBA.
   (c) Define Third Normal Form.
   (d) Explain the term tuple with example.
   (e) What is functional dependency ?
   (f) Define strong entity.
   (g) What is difference between char and varchar ?
   (h) State any two advantages of DBMS over file system.
   (i) What is Aggregation ?
   (j) What are the types of Data Independence ?
2. Attempt any four of the following: \[4 \times 5 = 20\]

(a) Differentiate between specialization and generalization.

(b) Write short note on Data Abstraction.

(c) Explain the following command with example:
    (i) Update
    (ii) Alter.

(d) Consider the relation:
    \[ R(A, B, C, D, G, H, I) \]

and the set of FD’s defined on \( R \) as:

\[ F = \{ A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow H \} \]

Compute the closure of \( F \) i.e. \( F^+ \).

(e) What is Primary Index? What are different types of ordered index? Explain in brief.

3. Attempt any four of the following: \[4 \times 5 = 20\]

(a) Explain overall DBMS structure with neat diagram.

(b) What are the anomalies that might arise if we have redundant data?

(c) Discuss various forms of outer join with example.

(d) What are desirable properties of decomposition? Explain in brief.

(e) What are integrity constraints? How are they classified?
4. (A) Attempt any *three* of the following: \[3 \times 5 = 15\]

(a) Consider the following relations

Country (c_code, name, capital)

Population (p_code, population)

Country and population are related with one to one relationship. Create a relational database in 3NF and solve the following queries in SQL:

(i) Give the name and population of country whose capital is ‘Delhi’.

(ii) List the name of all countries whose population is greater than 75,00,000.

(iii) To print countrywise population.

(b) Consider the following relations:

Game (g_no, gname, no_of_player, coach_name, captain)

Player (p_no, pname)

Game and player are related with many to many relationship. Create a relational database in 3NF and solve the following queries in SQL:

(i) Count the total number of players whose coach name is ‘Mr. Patil’.

(ii) List the name of player playing Hockey and Tennis.

(iii) Delete all the players playing Basketball.
(c) Consider the following relations

Machine (m_no, m_name, m_type, m_cost)

Part (p_no, p_name, description)

Machine and part are related with one to many relationship. Create a relational database in 3NF and solve the following queries in SQL:

(i) Increase the cost of machine by 35%.

(ii) List all machine whose cost > 25,000.

(iii) Display machine name and cost having parts gear box and steering.

(d) Consider the following relations

Company (c_id, c_product, c_name, region, state)

Branches (b_id, b_name, b_product, city)

Company and Branches are related with one to many relationship. Create a relational database in 3NF and solve the following queries in SQL:

(i) List all the cities having branch product ‘CPU’ and ‘MOUSE’.

(ii) List all the states whose branch product is ‘Pen Drive’.

(iii) Print citywise branches in descending order.
(B) Attempt any one of the following: [1x5=5]

(a) Consider the following relations:

Doctor (doct_no, doct_name, doct_address, doct_city)
Hospital (hosp_no, hosp_name, street, hosp_city)
Doct_Hosp (doct_no, hosp_no, date)

Solve the following queries in relational algebra.

(i) List the names of doctors who live in ‘Pune’.
(ii) List all the hospitals visited by ‘Dr. Sharma’.
(iii) List all the doctors visited to ‘Nobel Hospital’ on 02-06-2016.
(iv) List all doctors working in ‘Ruby hospital’.
(v) Find all doctors who living and visiting to the hospital from the same city.

(b) Consider the following relations:

Item (i_code, i_name, price)
Order (o_code, date, cust_name)

Item-order (i_code, o_code, quantity)

Solve the following queries in relational algebra.

(i) List all the item name whose price < 3000.
(ii) List all the order before 10th July 2016.
(iii) Find most costly item.
(iv) List all the items along with their prices.
(v) List only those item name whose quantity < 45 ordered by customer Mahesh.
5. (A) Now a days there are many multiplex theaters opened in Nashik city. These multiplex theaters can show 3 to 6 movies at a time. Theaters self decide which movie has to be shown to peoples for longer times. Movie is of two types : Universal and adults. Adult’s movie cannot allow to age below 18 persons. Many theaters have AC and doubly digital sound quality system. The ticket of movie is along with taxes or tax-free. Based on above information:

(i) Design an E-R diagram.

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

(B) Differentiate between strong entity and weak entity with suitable example. [3]

Or

Explain division operator with example.
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. Attempt any eight of the following : [16]

(i) If p and q are true and r and s are false statements, find the truth value of the following statements :

(a) \( p \land (r \rightarrow s) \)

(b) \( \neg (p \land \neg r) \lor (\neg q \lor s) \).

(ii) Define partially ordered set (Poset). Give one example.

(iii) State Pigeonhole principle. How many students should be chosen from a class so that at least two of them have last names that begin with the same letter ?

(iv) Consider the recurrence relation \( a_n = 3a_{n-1} + a_{n-2} \) with \( a_4 = 13 \) and \( a_5 = 43 \). Find \( a_3 \) and \( a_7 \).

(v) Prove that \( \neg (p \rightarrow q) \) and \( p \land \neg q \) are logically equivalent.

P.T.O.
(vi) Explain Handshaking lemma. Verify it for the following graph:

![Graph Image]

(vii) Find maximum edge connectivity of a graph having 10 vertices and 16 edges.

(viii) Draw all non-isomorphic subgraphs of $C_5$, the cycle graph on five vertices.

(ix) Define simple symmetric digraph and complete digraph.

(x) A city contains 5 metro stations A, B, C, D and E. Does there exist metro routes such that each station is directly connected to 3 other metro stations? Justify.

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

(i) Draw Hasse diagram of $D_{28}$ (the set of divisors of 28) with respect to partial order relation 'divides'. Is it a complemented lattice? Justify.

(ii) Using combinatorial argument, prove that:

$$C(n, r) + C(n, r - 1) = C(n + 1, r).$$
(iii) How many words of length 4 can be formed from the letters \( \{a, b, c\} \) such that either first letter is ‘a’ or the last letter is ‘c’.

(iv) Let \((B, \wedge, \vee, -)\) be a Boolean algebra. Then for any \(a, b, \in B\), prove that \(\overline{a \vee b} = \overline{a} \wedge \overline{b}\).

(v) Let \(a_n\) be the number of regions into which the plane is decomposed by \(n\) straight lines, no two of which are parallel and no three are concurrent. Find recurrence relation for \(a_n\).

(vi) Translate the following sentences into symbolic form using quantifiers. Also write their negations:

(a) Some real numbers are rational

(b) All mathematicians are brilliant.

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

(i) Solve:

\[a_{n+2} + 3a_{n+1} + a_n + 9.2^n = 0, \ a_0 = 4, \ a_1 = -9.\]

(ii) (a) Convert the following statement into symbolic form and hence write its converse, inverse and contrapositive.

“If an angle is a right angle then its measure is 90°.”

(b) Test validity of the following argument:

\[R \rightarrow N, \ T \rightarrow B, \ (N \lor B) \rightarrow S, \ \sim S \vdash \sim (R \lor T).\]

(iii) Find disjunctive normal form of the following Boolean expression:

\[E(x, y, z) = (x \land (y \lor z)) \lor (y \land z).\]
4. Attempt any four of the following:

(i) Draw the graph whose incidence matrix is:

\[
\begin{bmatrix}
1 & 1 & 0 & 1 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 1 \\
1 & 0 & 1 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1 & 0 & 1
\end{bmatrix}
\]

Hence write its adjacency matrix.

(ii) Find centre, radius and diameter of the following tree:

(iii) Using Kruskal’s algorithm, find minimum weighted spanning tree in the following graph.
(iv) Draw the following graphs:
   (a) 3-regular bipartite graph
   (b) Self complementary graph
   (c) Binary tree on 11 vertices with minimum height
   (d) Eulerian graph.

(v) In the following network, determine missing figures, so that the result is a flow in a given network:

(vi) Let $e$ be any edge in a connected graph $G$. Prove that $e$ is an isthmus if and only if $e$ is not contained in any cycle in $G$.

5. Attempt any two of the following: [16]
   (i) Prove that if $G$ is a simple graph with $n$ vertices, $m$ edges and $k$ components, then:

   \[ m \leq \frac{(n - k) (n - k + 1)}{2}. \]
(ii) Using Dijkstra’s algorithm, determine shortest path from \( a \) to all other vertices in the following graph:

![Graph Image]

(iii) (a) Prove that the number of pendant vertices in a binary tree with \( n \) vertices is \( \frac{n + 1}{2} \).

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

\[
\frac{x + y}{x^2 + 3y} + xy.
\]
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 non-programmable scientific calculator is allowed.

1. Attempt any eight of the following :  [16]
   (i) Let
       \[ R = \{(1, 1), (1, 2), (2, 3), (1, 3), (3, 1), (3, 2)\} \]
       be a relation on a set \( A = \{1, 2, 3\} \). Draw a digraph of \( R \).
   (ii) If \( a, b, c, d \) are integers such that \( a \mid b \) and \( c \mid d \), then prove that \( ac \mid bd \).
   (iii) Let \( Q \) be the set of rational numbers. A binary operation * on \( Q \) is defined as \( a * b = ab + 1 \). Determine whether * is associative.

P.T.O.
(iv) Define a group.

(v) Discuss the continuity of function \( f(x) \) defined by:

\[
f(x) = \frac{x-|x|}{x}
\]

at \( x = 0 \).

(vi) Let \( f: \mathbb{R} \rightarrow \mathbb{R} \) be defined by \( f(x) = 2x - 1 \) and \( g: \mathbb{R} \rightarrow \mathbb{R} \) be defined by \( g(x) = x^2 \), find \( g \circ f(x) \).

(vii) If \( y = a^{mx} \), then find \( n \)th derivative of \( y \).

(viii) State Taylor’s theorem with Lagrange’s form of remainder.

(ix) What are the possible values of rank for a matrix \( A_{3 \times 4} \)?

(x) State Cauchy mean value theorem.

2. Attempt any four of the following:

(i) Let \( R \) be a relation on \( \mathbb{Z} \) defined by \( xRy \) if and only if \( 5x + 6y \) is divisible by 11, for \( x, y \in \mathbb{Z} \).

Show that \( R \) is an equivalence relation on \( \mathbb{Z} \).

(ii) Let a function \( f: \mathbb{R} \rightarrow \mathbb{R} \) be defined by \( f(x) = 2x - 3 \). Show that \( f \) is bijective. Also find inverse of \( f \).

(iii) Express the following permutation \( \sigma \) in \( S_7 \) as a product of disjoint cycles and hence find order of \( \sigma \):

\[
\sigma = \begin{pmatrix}
1 & 2 & 3 & 4 & 5 & 6 & 7 \\
3 & 4 & 1 & 5 & 2 & 7 & 6
\end{pmatrix}
\]

Also determine whether \( \sigma \) is even or odd.
(iv) Show that $\sqrt{5}$ is not a rational number.

(v) Prove that for any two integers $a$ and $b$, $a \equiv b \pmod{n}$ if and only if $a$ and $b$ leave the same remainder when divided by $n$.

(vi) Find the remainder of $9^{394}$ when divided by 11.

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

(i) Obtain the transitive closure of $R$ defined on a set $A = \{a, b, c, d\}$ by using Warshall’s algorithm where:

\[ R = \{(a, a), (a, d), (b, b), (c, d), (d, b), (d, d)\}. \]

(ii) Write the composition table for $(z_8, +_8)$ and

(a) Find the order of all elements.

(b) Find all subgroups.

(c) Is it a cyclic group? If yes, write all generators.

(iii) Find greatest common divisor $d$ of 4999 and 1109. Hence find integers $m$ and $n$ such that:

\[ d = 4999m + 1109n. \]

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

(i) Verify the Lagrange’s mean value theorem for the function:

\[ f(x) = \log(x) \]

on $[1, e]$. 

[5216]-4

3

P.T.O.
(ii) Find the values of $\alpha$ and $\beta$ if the function $f(x)$ is continuous in $(-2, 3)$ where:

$$f(x) = \begin{cases} 
4x + 5, & \text{if } -2 < x < 0 \\
2x + \alpha, & \text{if } 0 \leq x < 1 \\
x - 3\beta, & \text{if } 1 \leq x < 3 
\end{cases}$$

(iii) Find $n$th derivative of:

$$y = \frac{1}{x^2 - x - 2}.$$

(iv) Expand $\log(\sin(x))$ in ascending power of $(x - 3)$.

(v) Solve the linear system:

$$x - y - z + 2w = 1$$
$$2x + y + 4z + w = 1$$
$$3x + y + 5z + 4w = -3.$$  

(vi) Reduce the following matrix $A$ to row echelon form:

$$A = \begin{bmatrix}
1 & 2 & 1 & 3 \\
2 & 4 & 6 & 8 \\
3 & 5 & 7 & 9 \\
0 & 1 & 0 & 1
\end{bmatrix}$$

Find rank of $A$. 

[5216]-4
5. Attempt any two of the following:

(i) State and prove Rolle's theorem. Verify Rolle's theorem for function:

\[ f(x) = x^2 - 2x + 1 \]

in \([0, 2]\).

(ii) Solve by LU decomposition method:

\[
\begin{align*}
  x + 2y - 4z &= -4 \\
  2x + 5y - 9z &= -10 \\
  3x - 2y + 3z &= 11.
\end{align*}
\]

(iii) (a) If \( y = \tan^{-1}(x) \), then prove that:

\[
(1 + x^2)y_{n+2} + 2(n+1)xy_{n+1} + n(n+1)y_n = 0.
\]

(b) Evaluate:

\[
\lim_{x \to 0} \left( \frac{a}{x} - \cot \left( \frac{x}{a} \right) \right).
\]
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) List different types of switches.

(b) What is the difference between series clipper and parallel clipper ?

(c) Find out the voltage across each resistor in the following circuit. Verify KVL.

\[ \begin{array}{c}
R_1 & 2 \text{ K}\Omega \\
2 \text{ K}\Omega & \text{3 K}\Omega \\
30 \text{ V} & \end{array} \]

P.T.O.
(d) What are the biasing conditions of transistor to work as class A Amplifier.

(e) Draw frequency response of ideal Low Pass and High Pass Filter.

(f) Draw symbols for NPN transistor and UJT.

(g) Define the terms Pinchoff voltage and amplification factor for JFET.

(h) List values for input impedance, bandwidth, CMRR and output impedance for op-amp 741.

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

(a) Explain classification of resistors.

(b) Find the Norton’s equivalent circuit in the following circuit.

(c) Draw block diagram of power supply and give function of each block.

(d) Explain voltage divider biasing technique for BJT.
(e) With neat diagram explain working of P-channel JFET.

(f) Draw the circuit diagram of op-amp as adder and derive the expression for its output voltage.

3. Attempt any four of the following: \[4\times 4=16\]

(a) Define the following parameters related to op-amp:

(i) Input impedance

(ii) CMRR

(iii) Slew rate

(iv) Input off-set current.

(b) Explain working of UJT.

(c) Differentiate between JFET and MOSFET.

(d) Explain working of photo diode.

(e) Verify maximum power transfer theorem for given circuit.

\[
\begin{align*}
R_i &= 100 \, \Omega \\
R_{L_1} &= 50 \, \Omega \\
R_{L_2} &= 100 \, \Omega \\
R_{L_3} &= 150 \, \Omega
\end{align*}
\]

(f) Draw symbols for step up and step down transformer. Obtain turns ratio of transformer, if \(V_S = 20 \, \text{V}\) and \(V_P = 250 \, \text{V}\).
4. Attempt any *four* of the following: \([4\times 4=16]\)

(a) Draw dc load line for given circuit. Assume a silicon transistor.

(b) Explain JFET as a voltage variable resistor.

(c) Draw the circuit diagram of op-amp as Non-inverting amplifier and derive the expression for its output voltage.

(d) With neat diagram explain working of electromagnetic relay.

(e) Draw the Thevenin's equivalent circuit for given circuit.

(f) Explain working of positive clamper circuit.
5. Attempt any two of the following: \[8\times 2=16\]

(A) (i) What are the different types of connectors? Give one application of each.

(ii) Determine the current through \(R_3\) in the following circuit using Kirchhoff’s Laws.

(B) (i) Identify the following circuits and find the output voltage.

![Circuit diagram]

(a) 2 V
-3 V

(b) 5 V
(ii) Differentiate between CC, CB and CE configuration of transistor.

(C) (i) Derive the expression for the charging current of a capacitor and plot the graph of charging current versus time.

(ii) Explain how transistor act as a switch.
Total No. of Questions—5] [Total No. of Printed Pages—4

Seat No.

[5216]-6

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

ELECTRONICS SCIENCE

Paper II

ELE-102 : Principles of Digital Electronics

(2013 PATTERN)

Time : Three Hours Maximum Marks : 80

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

(ii) Neat diagram must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

1. Attempt all of the following : [8×2=16]

(a) Differentiate between weighted and unweighted code.

(b) Define the term minterm.

(c) Draw the logic diagram for half adder.

(d) For a decoder having 32 states what will be the number of control lines required.

(e) Mention why synchronous counters are faster than asynchronous counters.

(f) Draw the symbol of a tristate inverter and give its truth table.

(g) Differentiate between encoder and decoder.

(h) What is a ring counter ?

P.T.O.
2. Attempt any four of the following: \[4\times4=16\]

(a) Perform the following:

(i) \((11101)_{\text{Gray}} = (?)_2\)

(ii) \((479)_{10} = (?)_{\text{BCD}}\)

(b) Simplify the given expression using rules of boolean algebra:

\[Y = (\overline{A} + B + C)(A + \overline{B} + C)\]

(c) With a neat logic diagram explain the working of a full subtractor.

(d) Explain the working of 4 : 1 multiplexer using NAND gates.

(e) Show the connections required to convert JK Flip-Flop to D Flip Flop and T Flip-Flop. Write the truth table for the same.

(f) With suitable diagram explain the working of CMOS NOT gate.

3. Attempt any four of the following: \[4\times4=16\]

(a) Draw the symbol and give the truth table for:

(i) 2-input AND gate

(ii) 2-input OR gate

(b) Construct NAND gate and NOT gate using NOR gates.
(c) With neat diagram explain the working of 4-bit universal adder-subtractor.

(d) Draw logic diagram for Hex to Binary conversion.

(e) Show the connections of IC7490 for MOD 7 and MOD 3 operation.

(f) Define the parameters for a logic family:
   (i) Fan in
   (ii) Switching speed
   (iii) Logic levels
   (iv) Propagation delay.

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

(a) Write a short note on Alphanumeric codes.

(b) Simplify the given expression using K-map. Draw the simplified diagram:

\[ Y = \overline{A}B\overline{C} + \overline{A}B\overline{C} + AB\overline{C} + A\overline{B}C + \overline{A}BC + ABC \]

(c) Explain with block diagram the working of ALU.

(d) What are the different types of 7 segment displays? Explain the working of each type.

(e) With neat logic diagram explain the working of 3-bit parallel in parallel out shift register.

(f) Write a short note on logic families.
5. Attempt any two of the following: [2x8=16]

(a) (i) Explain the working of 3-bit parity generator with suitable diagram.
(ii) Perform \((45)_{10} - (23)_{10}\) using 2's complement method.

(b) Explain the working of 3-bit synchronous up counter with suitable logic diagram. Draw the timing diagram for the same.

(c) (i) With neat diagram explain the working of 3x4 matrix keyboard encoder.
(ii) State and prove the De-Morgan's theorems.
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 :

      (i) For plotting histogram for an exclusive grouped frequency distribution .................. are plotted on X-axis.

      (ii) The mode of data set 6, 6, 6, 6, 6 is ................. .

      (iii) Sum of probabilities of all values of a discrete random variable is ................. .

      (iv) A Bernoulli random variable assumes only ................. values.

P.T.O.
(B) Select the most appropriate option for each of the following: [1 mark each]

(i) If variance of $X = 7$, then variance of $(3X + 5)$ is:
   (a) 68
   (b) 26
   (c) 63
   (d) 38

(ii) Let $X \rightarrow P(\lambda = 5)$. Mean of $X$ is:
    (a) 5
    (b) 25
    (c) $\sqrt{5}$
    (d) 3

(iii) For a bivariate data $b_{yx} = -0.2$ and $b_{xy} = -1.8$, then value of correlation coefficient is:
     (a) $-0.6$
     (b) $-0.36$
     (c) 0.6
     (d) 0.36

(iv) In a trivariate data, the correlation coefficient between any two variables when the effect of third variable is eliminated is called as:
     (a) Simple correlation
     (b) Partial correlation
     (c) Multiple correlation
     (d) Multiple regression
(C) Attempt each of the following:

(i) Define the terms: attribute and variable.

(ii) State additive property of a binomial distribution.

(iii) State components of time series.

(iv) A random variable $X$ assumes 3 values $-2, 0, 2$ with probabilities $\frac{1}{2}, \frac{1}{6}, \frac{1}{3}$ respectively. Find the probability mass function of $Y = 3X - 2$.

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

(a) Describe the procedure to plot greater than ogive curve for a grouped frequency distribution.

(b) Marks of 20 students are given below:


Prepare a stem and leaf chart for the above data.

(c) Discuss mean as a measure of central tendency. State demerits of mean.

(d) The statistics of runs scored by players A and B in 5 test matches are shown below:

<table>
<thead>
<tr>
<th>Player A</th>
<th>Player B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>53</td>
</tr>
<tr>
<td>S.D.</td>
<td>40</td>
</tr>
</tbody>
</table>

[5216]-7 3 P.T.O.
Examine:

(i) Which player is more consistent?

(ii) Which player is better in average?

(e) Define quartiles. Explain the procedure of computing lower quartile (Q₁) for grouped frequency distribution.

(f) Locate the value of mode using a suitable graph for the following data:

<table>
<thead>
<tr>
<th>Marks of Students</th>
<th>No. of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0—20</td>
<td>7</td>
</tr>
<tr>
<td>20—40</td>
<td>11</td>
</tr>
<tr>
<td>40—60</td>
<td>22</td>
</tr>
<tr>
<td>60—80</td>
<td>15</td>
</tr>
<tr>
<td>80—100</td>
<td>05</td>
</tr>
</tbody>
</table>

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

(a) Explain the procedure of obtaining Box-plot.

(b) The variance of a distribution is 16. What should be the value of fourth central moment if the distribution is:

(i) mesokurtic

(ii) platykurtic?

(c) Explain concept of skewness of a frequency distribution. Discuss types of skewness with the help of a diagram.
(d) A discrete random variable $X$ has the following probability distribution:

<table>
<thead>
<tr>
<th>$X$</th>
<th>$P[X = x]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$K$</td>
</tr>
<tr>
<td>1</td>
<td>$3K$</td>
</tr>
<tr>
<td>2</td>
<td>$5K$</td>
</tr>
<tr>
<td>3</td>
<td>$7K$</td>
</tr>
<tr>
<td>4</td>
<td>$11K$</td>
</tr>
<tr>
<td>5</td>
<td>$13K$</td>
</tr>
</tbody>
</table>

Find:

(i) The value of $K$.

(ii) Distribution function of a random variable $X$.

(e) Define central moments for a discrete frequency distribution. Express first and second central moments in terms of raw moments.

(f) Let $X$ follows binomial distribution with parameters $n = 10$ and $p = 0.5$. Find:

(i) $P(X \leq 1)$

(ii) $P(X \geq 2)$.

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

(a) (i) What is scatter diagram? How does it help in deciding nature and degree of correlation between two variables?
(ii) If
\[ n = 50, \Sigma X = 75, \Sigma Y = 80, \Sigma X^2 = 130, \Sigma Y^2 = 140, \Sigma XY = 120, \]
find the value of Karl Pearson's coefficient of correlation between \( X \) and \( Y \) and interpret its value.

(b) (i) Describe the stepwise procedure of fitting of the equation of line of regression of \( Y \) on \( X \) by method of least squares.

(ii) If \( X \) and \( Y \) are independent Poisson random variables with means 2 and 4 respectively. State the distribution \( X + Y \). Also find \( P(X + Y \leq 2) \).

(c) (i) Define Geometric distribution. State its mean and variance. Also give a real life situation where it can be used.

(ii) A roulette wheel is divided into 25 sectors of equal area numbered from 1 to 25. Let \( X \) be the number that occurs when the wheel is spun. Find:

1. Probability mass function of \( X \).
2. \( P(X \geq 15) \)
3. Mean of \( X \).

(d) (i) Describe the procedure of fitting an exponential curve \( Y = ab^X \) by using the method of least squares for a bivariate data.

(ii) For a trivariate data \( r_{12} = 0.3, r_{13} = 0.5, r_{23} = 0.4 \), find \( r_{12.3} \) and \( R_{1.23} \).
5. Attempt any one of the following:

(a) (i) Explain the method of fitting a second degree curve:

$$Y = a + bX + cX^2$$

for a bivariate data.

(ii) Calculate trend by 4 yearly centered moving average:

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>464</td>
</tr>
<tr>
<td>2002</td>
<td>515</td>
</tr>
<tr>
<td>2003</td>
<td>518</td>
</tr>
<tr>
<td>2004</td>
<td>467</td>
</tr>
<tr>
<td>2005</td>
<td>502</td>
</tr>
<tr>
<td>2006</td>
<td>540</td>
</tr>
<tr>
<td>2007</td>
<td>557</td>
</tr>
<tr>
<td>2008</td>
<td>571</td>
</tr>
<tr>
<td>2009</td>
<td>586</td>
</tr>
<tr>
<td>2010</td>
<td>612</td>
</tr>
</tbody>
</table>

(b) (i) The equations of two lines of regression obtained in a correlation analysis are:

$$2X - 3Y + 6 = 0$$ and $$4Y - 5X - 8 = 0$$

(a) Obtain the means of X and Y.

(b) Find the value of regression coefficient of Y on X.

(c) Find the value of regression coefficient of X on Y.

(d) Find the value of correlation between X and Y.
(ii) From the following results obtained in a study of a random sample of 120 students obtain least square regression equation of $X_3$ on $X_1$ and $X_2$. Also estimate $X_3$ when $X_1 = 60, X_2 = 78$.

Given:

\[
\bar{X}_1 = 68, \quad \bar{X}_2 = 70, \quad \bar{X}_3 = 74
\]

\[
\sigma_1^2 = 100, \quad \sigma_2^2 = 25, \quad \sigma_3^2 = 81
\]

\[
r_{12} = 0.60, \quad r_{13} = 0.70, \quad r_{23} = 0.65
\]

Where $X_1, X_2, X_3$ denote the percentage of marks obtained by students in test-1, test-2 and the final examination respectively.
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 :

\[4 \times 1 = 4\]

(i) Two events $A$ and $B$ defined on the sample space $S$ are said to be exhaustive if $A \cup B = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$.

(ii) If two events $A$ and $B$ are independent then $P(A/B) = \ldots \ldots \ldots \ldots \ldots$.

(iii) Variance of a Pareto distribution with parameter $\alpha$ is $\ldots \ldots \ldots \ldots \ldots$.

(iv) For testing the symmetry of the sample we use $\ldots \ldots \ldots \ldots \ldots$ test.

P.T.O.
(B) Select most appropriate option for each of the following:

\[4\times 1 = 4\]

(i) The probability of a sure event is:

(a) 1
(b) 0
(c) 0.5
(d) 0.8

(ii) If A and B are two events defined on the sample space
S such that \(P(A) = 0.5, \ P(B) = 0.6\) and \(P(A \cap B) = 0.3\);
then \(P(A \cap B') = 0.3\) is:

(a) 0.8
(b) 0.3
(c) 0.2
(d) 0.9

(iii) For a continuous random variable X if \(V(X) = 2/5\), then
\(V(5X)\) is:

(a) 5
(b) 10
(c) 2
(d) 25

(iv) Level of significance is the probability of:

(a) rejection of null hypothesis
(b) acceptance of null hypothesis
(c) rejection of null hypothesis when it is true
(d) rejection of null hypothesis when it is false
(C) Attempt each of the following: \[4\times 2=8\]

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

\[
f(x) = \begin{cases} 
3x^2 & , \quad 0 \leq x \leq 1 \\
0 & , \quad \text{otherwise}
\end{cases}
\]

Obtain \(P(1/4 \leq X \leq 3/4)\).

(ii) Explain the concept of permutation with the help of an example.

(iii) State normal approximation to binomial distribution.

(iv) State Linear Congruential Generator explaining its parameters.

2. Attempt any four of the following: \[4\times 4=16\]

(a) From 6 positive and 10 negative numbers, 4 are picked at random (without replacement) and multiplied. What is the probability that the product is negative?

(b) Define:

(i) Non-deterministic experiment

(ii) Sure event

(iii) Sample space

(iv) Exhaustive events

(c) In a random arrangement of the letters of the word ‘DREAM’ find the probability that:

(i) All the vowels come together

(ii) The arrangement starts with D and ends with M

[5216]-8 3 P.T.O.
(d) State giving reasons whether the following can be taken as probability models or not for a sample space:

\[ S = \{w_1, w_2, w_3, w_4\} \]

(i) \( P(w_1) = 1/8, P(w_2) = 2/8, P(w_3) = 2/8, P(w_4) = 1/8 \)

(ii) \( P(w_1) = 1/8, P(w_2) = 2/8, P(w_3) = 3/8, P(w_4) = 2/8 \)

(e) A departmental store accepts either cash or card. The probability that a customer will carry cash is 0.25. The probability that he will carry card is 0.62 and will carry both cash and card is 0.12. What is the probability that the customer will carry:

(i) Either cash or card or both

(ii) Only cash or only card

(f) State classical definition of probability. Also state its limitations.

3. Attempt any four of the following: \([4\times4=16]\)

(a) If A and B are any two events defined on the sample space S. Then show that:

\[ P(A \cup B) = P(A) + P(B) - P(A \cap B). \]

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

\[ f(x) = \begin{cases} 6x(1-x) & , \ 0 \leq x \leq 1 \\ 0 & , \ \text{otherwise} \end{cases} \]

Obtain the mean and variance of X.
(c) Define the following:

(i) Expectation of a continuous random variable X.

(ii) Median of a continuous random variable X.

(d) Explain partition of a sample space. Also state Bayes’ theorem.

(e) If X follows uniform distribution over \((-a, a)\), determine ‘a’ such that \(P(X > 1) = 1/4\). Also find \(P(-1 < X < 1)\).

(f) Define sensitivity and specificity of test procedures.

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

(a) (i) State any four properties of normal distribution.

(ii) The lifetime of a microprocessor is exponentially distributed with mean 4000 hours. Find the probability that the microprocessor will fail within 2500 hours. Also find the probability that it will function for more than 5000 hours.

(b) (i) Given below is a sample of 10 lengths of rods produced on a lathe machine. The population median length is claimed to be 0.5. Test this claim at 5% L.O.S.

0.37, 0.62, 0.47, 0.52, 0.64, 0.43, 0.82, 0.68, 0.35, 0.42.

(ii) Define exponential distribution with parameter \(\theta\). Also state the lack of memory property of exponential distribution.
(c) (i) If X and Y are two independent random variables having 
N(2, 4) and N(3, 9) distribution respectively, identify 
the distribution of W = 2X + 3Y and find P(W ≥ 15).

(ii) Explain the procedure of run test.

(d) (i) Explain the stepwise procedure for generating a random 
sample from normal distribution using Box-Muller 
transformations.

(ii) In a college there are two faculties Arts and Science. 
The average weight of students in a sample of 250 in 
Arts faculty was found to 120 lbs with standard 
deviation of 12 lbs. While the corresponding figures in 
a sample of 400 students from Science faculty were 124 
lbs and 14 lbs. Test whether there is any significant 
difference in the average weight of the students of two 
faculties ? Use 1% L.O.S.

5. Attempt any one of the following :

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

Sample

Hypothesis

Test statistic

p-value
(ii) A publisher claims that average expenditure on textbooks in Statistics in a year by students in senior college is Rs. 300. In order to test the claim 250 students were selected at random. It was observed that these students spent on an average Rs. 292 on the books with standard deviation of Rs. 35. Can you conclude that average expenditure is less Rs. 300. Use 1% L.O.S. 

(iii) The following record shows the additional hours of sleep in two sets of patients due to two soporific drugs.

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Drug A</th>
<th>Drug B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>2</td>
<td>2.0</td>
<td>3.1</td>
</tr>
<tr>
<td>3</td>
<td>1.7</td>
<td>2.1</td>
</tr>
<tr>
<td>4</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>5</td>
<td>1.6</td>
<td>1.8</td>
</tr>
<tr>
<td>6</td>
<td>2.0</td>
<td>1.9</td>
</tr>
<tr>
<td>7</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td>8</td>
<td>3.2</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Examine whether the drugs differ in their effect. Use 5% level of significance. 

(b) (i) Explain the procedure of testing the equality of two population proportions based on large samples. 

[5216]-8 7 P.T.O.
(ii) Based on 500 randomly selected fields about the tenancy status of the cultivators of these fields and use of fertilizers collected in an agro-economic enquiry, the following classification was noted:

<table>
<thead>
<tr>
<th></th>
<th>Owned</th>
<th>Rented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using fertilizers</td>
<td>208</td>
<td>92</td>
</tr>
<tr>
<td>Not using fertilizers</td>
<td>32</td>
<td>168</td>
</tr>
</tbody>
</table>

Test whether use of fertilizers is independent of ownership of land. Use 5% level of significance. [4]

(iii) The following data are relating to the time required (in minutes) to type a certain matter of different pages:

<table>
<thead>
<tr>
<th>No. of pages</th>
<th>Time required to type</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

Using the above data test whether there is a significant correlation between X and Y. Use 5% level of significance. [8]
S.Y. B.Sc. (I Sem.) EXAMINATION, 2017
COMPUTER SCIENCE
Paper I
CS-211 : Data Structures Using ‘C’
(2013 PATTERN)

Time : Two Hours                         Maximum Marks : 40

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

1. Attempt all of the following :       [10×1=10]
   (a) What is meant by an abstract data type?
   (b) What is need for header?
   (c) What are postfix and prefix forms of the expression?
       \[ A + B \times (C - D)/(P - R) \]
   (d) Define stack. List out two operations of stack.
   (e) Define Theta notation (θ).
   (f) Define Priority Queue.
   (g) What is siblings?
   (h) Define balance factor.
   (i) What is time complexity of bubble sort?
   (j) Define node structure of a singly linked list.
2. Attempt any two of the following: \[2 \times 5 = 10\]

(a) Write a ‘C’ function to insert a node in a binary search tree.

(b) Write a ‘C’ function to push and pop for stack using singly linked list.

(c) Write a ‘C’ function to ADD & REMOVE from circular queue implemented using array.

3. Attempt any two of the following: \[2 \times 5 = 10\]

(a) Construct AVL tree for the following data:
NFD ZIM IND AVS NEL ENG SRL PAK

(b) Sort following data using Bubble sort:
32, 51, 85, 66, 23, 13, 10, 57.

(c) Consider the following adjacency matrix:

\[
\begin{bmatrix}
1 & 2 & 3 & 4 \\
1 & 0 & 1 & 0 & 0 \\
2 & 0 & 0 & 1 & 0 \\
3 & 0 & 0 & 0 & 1 \\
4 & 1 & 0 & 0 & 0 \\
\end{bmatrix}
\]

(i) Draw the graph.
(ii) Draw Adjacency list.
(iii) Draw the Inverse Adjacency List.

[5216]-101 2
4. Attempt either A or B : \[1 \times 10 = 10\]

(A) (i) What are the applications of stack ? \[4\]

(ii) Show steps in creating Binary Search tree for data : \[3\]

40, 70, 60, 50, 65, 20, 25.

(iii) Write an algorithm for BFS traversal of a graph. \[3\]

Or

(B) (i) Evaluate the following expression using stack : \[4\]

\[A + B \times C - D.\]

Given data : A = 4, B = 3, C = 5 and D = 1.

First convert expression to postfix.

(ii) Define the following terms : \[3\]

(1) Critical Path

(2) Data Structure

(3) Complete binary tree.

(iii) Sort the following numbers using insertion sort method : \[3\]

30, 40, 10, 50, 25, 35, 15.
S.Y. B.Sc. (Computer Science) (I Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

CS-212 : Relational Database Management System

(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.

(iv) Assume suitable data, if necessary.

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

(a) Define simple security property.

(b) Define the term Decomposition.

(c) Define fat client.

(d) What is Database security ?

(e) List the purpose of select INTO clause.

(f) What are different types of locks ?

(g) Differentiate between row-level trigger and statement level trigger.

(h) What do you mean by recoverable schedule ?

(i) List any two drawbacks of the shadow-page technique.

(j) List the actions of transaction recovered from deadlock.

P.T.O.
2. Attempt any two of the following: \[2 \times 5 = 10\]
   (a) Define transaction. Explain ACID properties of transaction.
   (b) Explain Mandatory Access control method in detail.
   (c) Define closure of set of functional dependencies. List any four Armstrong’s axioms.

3. Attempt any two of the following: \[2 \times 5 = 10\]
   (a) How client machine interact with server? Explain in detail.
   (b) Consider the following transaction:

<table>
<thead>
<tr>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>read (x)</td>
<td>read (y)</td>
</tr>
<tr>
<td>x := x - 70;</td>
<td>y := y + 10;</td>
</tr>
<tr>
<td>write (x);</td>
<td>write (y);</td>
</tr>
<tr>
<td>read (y)</td>
<td>read (z)</td>
</tr>
<tr>
<td>b := b + 70;</td>
<td>z := z - 5;</td>
</tr>
<tr>
<td>write (y);</td>
<td>write (y);</td>
</tr>
<tr>
<td></td>
<td>read (x);</td>
</tr>
<tr>
<td></td>
<td>write (z);</td>
</tr>
<tr>
<td></td>
<td>x := x - 15;</td>
</tr>
<tr>
<td></td>
<td>write (x);</td>
</tr>
</tbody>
</table>

   Give at least two non-serial schedule that are serializable.
(c) Consider the following relation-schema:

student(roll-no, name, address, class)
subject(code, subject-name)
stud-sub(roll-no, code, marks)

Write a function which will accept rollno from the user and will display name, subjectname, and marks for the subject.

4. Attempt the following (A or B): \[1\times10=10\]

(A) 
(a) Explain statistical database security. \[5\]

(b) Consider the following relation:

R(ABCD) and \(F = \{A \rightarrow B, A \rightarrow C, C \rightarrow D\}\).

If R is decomposed into \(R_1(ABD)\) with

\(F_1 = \{A \rightarrow B, A \rightarrow D\}\)

\(R_2(BC)\) with \(F_2 = \{B \rightarrow C\}\)

Find the Decomposition is dependency preserving or not. \[3\]

(c) Define throughput and Dirty read problem. \[2\]

\(Or\)

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

[start_transaction, T1]
[write_item, T1, A, 5]
[commit, T1]
[start_transaction, T2]
[write_item, T2, B, 10]
[write_item, T2, D, 6]
[commit, T2]
[checkpoint]
[start_transaction, T3]
[write_item, T3, B, 20]
[start_transaction, T4]
[write_item, T4, C, 10] ← system crash
If immediate update with checkpoint is used, what will be the recovery procedure? [5]

(b) Consider the following relation:
R(ABC,GHI) and
F = \{A → B, A → C, CG → H, CG → I, B → H\}. Compute closure of attribute set \((AG)^+\)? [3]

(c) Explain lost update problem and incorrect summary problem. [2]
S.Y. B.Sc. (Computer Science) (I Semester) 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 calculators is allowed.

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

(i) Determine if the following statement is true or false and justify your answer :

‘Every finite set of vectors in a vector space V that contains the zero vector of V is linearly dependent.’

P.T.O.
(ii) If the coordinates of the vector \( \vec{A} \) in \( \text{M}_{2 \times 2} \) are \( \frac{1}{3}, 1, \frac{-1}{4} \) and 1 with respect to the basis \( \{ \vec{A}_1, \vec{A}_2, \vec{A}_3, \vec{A}_4 \} \), then find \( \vec{A} \), where:

\[
\vec{A}_1 = \begin{bmatrix} 3 & 6 \\ 3 & -6 \end{bmatrix}, \quad \vec{A}_2 = \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}, \quad \vec{A}_3 = \begin{bmatrix} 0 & -8 \\ -12 & -4 \end{bmatrix}
\]

and

\[
\vec{A}_4 = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}.
\]

(iii) Determine if \( T : \mathbb{R}^2 \rightarrow \text{M}_{2 \times 2} \), defined as:

\[
T(a, b) = \begin{bmatrix} a + b & 0 \\ 2 & a - b \end{bmatrix};
\]

is a linear transformation.

(iv) Find the dimension of the column space of the matrix:

\[
\begin{bmatrix}
0 & 1 & 1 & -2 & 1 \\
0 & 0 & 1 & -1 \\
0 & 0 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0
\end{bmatrix}
\]

Justify your answer.
(v) Determine if the vector \( \mathbf{x} = \begin{bmatrix} 6 \\ 9 \\ 9 \end{bmatrix} \) is an eigen vector of the matrix
\[
\Lambda = \begin{bmatrix}
-1 & 4 & -2 \\
-3 & 4 & 0 \\
-3 & 1 & 3
\end{bmatrix}
\]
if yes, find the corresponding eigenvalue of \( \Lambda \).

(vi) Find maximum and minimum values of the quadratic form \( 2x_1^2 - x_2^2 \) subject to the constraints \( x_1^2 + x_2^2 = 1 \).

(vii) Consider the words \( x = 10101 \) and \( y = 01100 \). Find weights of the words \( x \) and \( y \) and the Hamming distance between \( x \) and \( y \).

2. Attempt any two of the following : \([10]\)

(i) Find a basis of the row space of the following matrix \( A \) that consist entirely of row vectors of \( A \) :
\[
A = \begin{bmatrix}
1 & 2 & 0 & 1 \\
2 & 1 & -1 & 0 \\
1 & 5 & 1 & 3 \\
5 & -2 & -4 & -3
\end{bmatrix}
\]

(ii) Determine if the matrix :
\[
A = \begin{bmatrix}
-5 & 2 & 3 \\
-2 & 0 & 2 \\
-4 & 2 & 2
\end{bmatrix}
\]
is negative semi-definite. Justify your answer.
(iii) Let \( S = \{\bar{u}_1, \bar{u}_2, \ldots, \bar{u}_r\} \) be a set of vectors in \( \mathbb{R}^n \). If \( r > n \), then prove that \( s \) is linearly dependent.

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

(i) Prove that a square matrix \( A \) is invertible if and only if \( \lambda = 0 \) is not an eigen value of \( A \).

(ii) Let \( T : \mathbb{R}^4 \rightarrow \mathbb{R}^2 \) be a linear transformation which is multiplication by the matrix :

\[
A = \begin{bmatrix} 4 & 1 & 5 & 2 \\ 1 & 2 & 3 & 0 \end{bmatrix}
\]

Find a basis of range of \( T \) and hence find rank and nullity of \( T \).

(iii) Determine if the following set of vectors

\[ \{1 - 3x^2, -1 + x + 2x^2, 2 + x + x^2\} \]

forms a basis for \( P_2 \).

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

(i) (a) Let

\[
H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}
\]

be a parity check matrix. Determine the \((2, 5)\) group code function \( e_H : B^2 \rightarrow B^5 \).
(b) Consider the group \( G = \{1, -1, i, -i\} \), where \( i = \sqrt{-1} \), with the operation of multiplication. Determine all left cosets of the subgroup \( H = \{1, -1\} \).

(ii) Determine if the following matrix \( A \) is diagonalizable. If yes, find the matrix \( P \) that diagonalizes \( A \):

\[
A = \begin{bmatrix}
-1 & 4 & -2 \\
-3 & 4 & 0 \\
-3 & 1 & 3
\end{bmatrix}
\]
S.Y. B.Sc. (Computer Science) (I 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 : [10]
(i) Define relative error and hence calculate relative error of 1/3 for approximated value is 0.3330.
(ii) Compute the value of $\sqrt{89}$ by using Newton-Raphson method (Take $x_0 = 9$) perform one iteration.
(iii) With usual notation, show that $(1 + \Delta)(1 - \nabla) = 1$.
(iv) State Lagrange's interpolation formula for unequal intervals.
(v) State Gauss forward interpolation formula for central interpolation.
(vi) State Euler-Maclaurin's formula for numerical integration.
(vii) Given that $Y = X + Y$ with $Y(0) = 1$. Find $Y(0.1)$ by Euler's method.

P.T.O.
2. Attempt any two of the following: [2x5=10]

(i) Derive Newton-Gregory formula for forward interpolation.

(ii) Find a real root of the equation $x \cdot e^x - 3 = 0$, using Regula Falsi method in interval (1, 1.5) correct to three decimal places.

(iii) Find the number of students from the following data who secured marks not more than 70:

<table>
<thead>
<tr>
<th>Marks less than</th>
<th>No. of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>41</td>
</tr>
<tr>
<td>40</td>
<td>103</td>
</tr>
<tr>
<td>60</td>
<td>168</td>
</tr>
<tr>
<td>80</td>
<td>218</td>
</tr>
<tr>
<td>100</td>
<td>235</td>
</tr>
</tbody>
</table>

Using divided difference formula.

3. Attempt any two of the following: [2x5=10]

(i) Derive the Simpson’s 1/3rd rule for numerical integration.

(ii) Apply Hermite’s interpolation formula to obtain polynomial of degree four from the following data:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>Y’</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>0</td>
</tr>
</tbody>
</table>

[5216]-104 2
(iii) Evaluate the integral:

\[ \int_{0}^{1.5} \frac{x^3}{e^x - 1} \, dx \]

by using Simpson's 3/8th rule.

4. Attempt any one of the following: [1x10=10]

(i) (a) A curve is drawn to pass through the points given by the following data:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1.5</td>
<td>2.4</td>
</tr>
<tr>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td>2.5</td>
<td>2.8</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td>4</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Estimate the area bounded by the curve, X-axis and the line X = 1, X = 4.

(b) Given \( \frac{dy}{dx} = -xy^2 \) with \( y(2) = 1 \). Find \( y(2.1) \) by Euler's modified method. (Take \( h = 0.1 \))

(ii) Given \( \frac{dy}{dx} = -2xy^2 \) with \( y(0) = 1 \). Find \( y(0.1) \) and \( y(0.2) \) correct to four decimal by Runge-Kutta method of fourth order.
S.Y. B.Sc. (Computer Science) (I Sem.) 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 diagrams must be drawn wherever necessary.

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

   (a) Define multicore processor.
   (b) What is BCD equivalent of decimal no. 8 ?
   (c) Draw state diagram for sequence 1, 3, 2, 8, 5, 1, .......
   (d) Draw frame structure of serial synchronous data transfer.
   (e) Convert (101101) binary to gray code.
   (f) What is data bus width of 80486 processor ?
   (g) Define “Hit Ratio”.
   (h) What is UART ?
   (i) “DMA data transfer is faster.” Comment.
   (j) For (1M × 16) memory chip, how many address lines and data lines are required ?

P.T.O.
2. Attempt any two of the following: [2x5=10]
   (a) Draw and explain two-level and three-level memory hierarchy.
   (b) Explain stack organisation with the help of block diagram.
   (c) Draw internal block diagram of 8086 processor.

3. Attempt any two of the following: [2x5=10]
   (a) Design 3-bit synchronous upcounter using JK-flip-flop.
   (b) Explain the various signals used for RS-232 serial communication.
   (c) Cache memory access time is 200 nS and main memory access time is 600 nS. What is average access time if no. of miss are 10 out of 50 references.

4. Attempt any one of the following: [1x10=10]
   (A) (i) What is priority interrupt? Explain Daisy chaining priority.
       (ii) Draw and explain internal architecture of a memory.
        Or
   (B) (i) Draw truth table of BCD to seven segment decoder for common cathode seven segment display. Using K-map, design a combinational circuit for glowing of segment ‘e’.
        (ii) What is super scalar architecture of pentium processor? Explain U & V pipeline of it.
S.Y. B.Sc. (Computer Science) (I Sem.) 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 the following questions in one or two sentences each :

(a) Define range of a sensor.

(b) What do you mean by order of a filter ?

(c) How many comparators are needed for a 8 bit simultaneous type ADC ?

(d) Name the temperature sensor IC.

(e) What is the role of a Wheatstone’s Bridge as signal conditioner ?

(f) Define resolution of a DAC.

(g) Name any two passive transducers.

(h) State any one application of pH sensor.

(i) Draw frequency response of an ideal low pass filter.

(j) Draw the circuit diagram for non-inverting amplifier using Opamp.

P.T.O.
2. Attempt any two of the following:  [2x5=10]

(a) Draw the neat block diagram of analog electronic system and explain function of each block.

(b) For a 3-bit Binary weighted resistor network (0 = 0 V, 1 = 5 V). Find full scale output and output due to LSB change. What are the disadvantages of Binary weighted resistor network.

(c) Draw the circuit diagram of instrumentation amplifier using three opamp. Derive expression for its gain.

3. Attempt any two of the following:  [2x5=10]

(a) State working principle of ultrasonic sensor. State any two applications of ultrasonic sensor.

(b) Draw the circuit diagram of first order active high pass filter and explain its frequency response.

(c) Draw and explain Water Level Indicator System.

4. Attempt any one of the following:  [1x10=10]

(A) (i) Explain Dual Slope ADC with the help of neat diagram.

(ii) Differentiate between active and passive filter.

Or

(B) (i) Explain working principle of capacitive type touch sensors. State any two applications where capacitive type touch sensors can be used.

(ii) With neat block diagram explain Intruder Detector system using PIR sensor.
S.Y. B.Sc. (Computer Science) (I Sem.) 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) Write a short note on ‘Planet’.

(ii) Describe Mercury and Mars briefly.

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

(i) How did science affect the human life ?

(ii) Who are the real enemies of man and how are they to be conquered ?

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

(i) What are the impacts of Television on Children ?

(ii) The Purdah emerges as a symbol of lost possibilities, decreased participation in life and increased withdrawal into self and shame. Explain the statement with reference to the poem ‘Purdah’.

P.T.O.
(B) Attempt any one of the following in about 100 words: [5]

(i) Explain the value of life and virtues depicted in the poem ‘A Psalm of Life’ by H.W. Longfellow.

(ii) What is the author’s attitude towards television?

3. (A) Fill in the blanks with appropriate antonyms of underlined words in the following sentences: [5]

(i) You can exclude some points. We discussed in your essay. But you must ....................... the advantages and disadvantages of studying abroad.

(ii) Reveal the evidence you have. Do not try to ....................... it.

(iii) The change in weather was not expected. It was ....................... .

(iv) Do not be a follower all your life. You have the qualities of a ....................... .

(v) What he is doing is not legal it is ....................... .

(B) Match the following to make useful collocations: [5]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>resolve</td>
<td>offer</td>
</tr>
<tr>
<td>free</td>
<td>an issue</td>
</tr>
<tr>
<td>infectious</td>
<td>permission</td>
</tr>
<tr>
<td>company</td>
<td>disease</td>
</tr>
<tr>
<td>grant</td>
<td>executive</td>
</tr>
</tbody>
</table>
4. (A) Fill in the blanks with appropriate tense forms of verbs given in the bracket:

(i) Our examination has begun and by next Saturday, I ........................... (write) my last paper.
    (Future Perfect Progressive Tense)

(ii) The postman ........................... (deliver) the letter this morning.
    (Simple Past Tense)

(iii) They ........................... (make) films for thirteen years.
    (Present Perfect Progressive Tense)

(iv) Ravi ........................... (stay) with his uncle and aunt.
    (Simple Present Tense)

(v) She ........................... (see) fifteen films this year.
    (Present Perfect Tense)

(B) Do as directed:

(i) Ramesh asked Anand to stay for lunch, but he left.
    (Change it into Complex sentence)

(ii) What you did helped us?
    (Change it into Simple sentence)

(iii) What a wonderful performance it is?
    (Change it into a Declarative sentence)
(iv) They presented him a trophy.

(Change the Voice)

(v) The officer said to the passenger, "Has she anything to declare"?

(Change it into Indirect speech)
(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) What are the characteristics of Mercury ?

   (ii) What common features do Venus and Earth share ?

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

   (i) State the advantages of scientific point of view as discussed in “The Scientific Point of View”.

   (ii) How does the author distinguish between the Life on TV and Life in Real in the lesson TV As Babusitter ?

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

   (i) What is Rosemary’s reaction when Philip refers to the lady, ‘astonishingly pretty’ ?

   (ii) Describe the changes made by the photographer in the features of narrator.
(B) Attempt any one of the following in about 100 words: [5]

(i) Sketch a word picture of Rosemerry Fell.

(ii) Bring out the humour from the story With the Photographer.

3. (A) Match the following: [5]

(i) prevent code

(ii) basic permission

(iii) dress a disaster

(iv) cultural concept

(v) grant identity

(B) Make sentences from the following: [5]

(i) effect/affect

(ii) right/write

(iii) accept/except

(iv) advice/advise

(v) fair/fare.

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

(i) She gave us a set of books.

[Change the voice]

(ii) Rashid said that he had written a novel.

[Change into Direct Speech]
(iii) Tom made mistakes in reading. He could not see well.

[Rewrite as a Compound sentence]

(iv) He is a man who is very intelligent.

[Rewrite as a Simple sentence]

(v) As soon as it stopped raining, Mohit left for work.

[Use No sooner ............... than]

(B) Do as directed : 

(i) I ................. (learn) different languages since I was in school.

[Present Perfect Progressive]

(ii) Madan first ................. (visit) Nagaland in 1980.

[Simple Past Tense]

(iii) My daughter ................. (return) home soon.

[Simple Future Tense]

(iv) Nisha ................. (arrive) by the time you reach home.

[Future Progressive]

(v) Rajesh ................. (work) in the bank since 2007.

[Present Perfect Progressive Tense]
S.Y.B.Sc. (Computer Science) (Sem. II) EXAMINATION, 2017
CS-221 : Object Oriented Concepts Using C++
Paper I
(2013 PATTERN)

Time : Two Hours
Maximum Marks : 40

N.B. :- (i) All questions are compulsory.
(ii) All questions carry equal marks.

1. Attempt all of the following : [10×1=10]
   (a) What is Data Encapsulation ?
   (b) State True/False : “Function can not return class object”.
   (c) What is an advantage of using reference variable ?
   (d) What is meant by dynamic constructor ?
   (e) Give the syntax of generic catch.
   (f) What is a template in C++ ?
   (g) State True/False : “A class can’t have overloaded destructor”.
   (h) What is the implication of the following statement ?
       Class A : Public B, Virtual Public C { ............ };
   (i) Differentiate between iso::ate and ios::app file opening modes.
   (j) State error in the following statement :
       cout << put ('X');

  P.T.O.
2. Attempt any *two* of the following: 

(a) What is the need of a friend function in C++? Write syntax and features of a friend function.

(b) Consider the class `Emp` (code, name, addr). Derive a class `Emp-Ac` (acc_no, joining_date) from `Emp`. Derive a class `Emp_sal` (basic_pay, earnings, deduction) from `Emp-Ac`. Declare member functions `accept( )` and `display( )` in each class. Accept and display data of ‘n’ objects of class `Emp-sal`.

(c) Define a class string having data members as : character array and integer length. Overload the following operators using member function :

(i) binary `+` : concatenate two strings.

(ii) unary `-` : change the case of an alphabet of a string.

3. Attempt any *two* of the following: 

(a) Explain the need of a constructor. How to overload constructors in C++? Explain with example.

(b) What is a class template? Explain with example.

(c) Two files names “Input1” and “Input2” contains sorted list of integers. Write a program that reads the contents of both the files and store the merged list in sorted form in a new file named “output”.

[5216]-201 2
4. Attempt any one of the following (A or B) : [1x10=10]

(A) (i) Write a C++ program to accept information about an item (code, name, quantity, rate). Raise an exception if negative number is entered for the quantity or rate. [4]

(ii) What is a pure virtual function? Give syntax to define it. Also write its significance. [3]

(iii) Identify errors in the following C++ code segment and correct them:

```cpp
int main( )
{

    float pi = 22.0/7.0;

    cout.fill ("\$");  

    cout << width (10);  

    cout . precision (.2);  

    cout << pi << “\n”;

}
```

Or

(B) (i) What is an inline function? Also write its limitations. [4]

(ii) Explain the concept of this pointer with example. [3]
(iii) Trace the output of the following C++ code segment. Assume there are no syntax errors.

Justify:

Class P

{
    Public : void print( ) {cout << “Inside P”;}
}

Class Q : Public P

{
    Public : void print( ) {cout << “Inside Q”;}
}

Class R : Public Q

{
    int main( )
    {
        R r;
        r.print( );
        return 0;
    }
}
S.Y.B.Sc. (Computer Science) (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) All questions carry equal marks.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data if necessary.

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

(a) State any two major activities represented in spiral model.
(b) List any two characteristics of MIS.
(c) What do you mean by Economical feasibility study?
(d) Define Logical DFD.
(e) What is meant by Structured Analysis?
(f) State one difference between iterative process flow and evolutionary process flow of a system.
(g) Define Software Requirement Specification (SRS).
(h) What do you mean by Inception?
(i) What is meant by Deployment?
(j) What is pair programming?
2. Attempt any two of the following: \[2\times 5=10\]
   
   (a) Explain Dynamic Systems Development method life cycle.
   
   (b) Write a short note on concurrent development model.
   
   (c) State and explain any five principles of software engineering practices.

3. Attempt any two of the following: \[2\times 5=10\]
   
   (a) Write a short note on Transaction processing system.
   
   (b) Compare structured interview with unstructured interview.
   
   (c) What do you mean by system design? Explain its types in detail.

4. Attempt the following: \[2\times 5=10\]
   
   (a) Write a note on Preliminary Investigation of a system.

   Or

   Explain the Requirement Engineering tasks in brief.

   (b) Draw context level, first level DFD for “Food Ordering Inventory System”, which maintains records of customers who orders the food. Managers keep the track of groceries which are provided by various suppliers. System also generates reports of inventory, order and bill.
S.Y. B.Sc. (Computer Science) (II Sem.) 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]

   (i) Determine whether the transformation matrix :

   \[
   [T] = \begin{bmatrix}
   1 & 1 \\
   \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\
   \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}}
   \end{bmatrix}
   \]

   represent reflection. Justify.

   (ii) If a square with side 2 cm is reflected through y-axis, then what is the area of transformed figure ?
(iii) Write transformation matrix for shear in z-co-ordinate by factor 
-4.5 units proportional to y-co-ordinate.

(iv) Determine foreshortening factors $f_x$ and $f_z$ of the matrix :

\[
[T] = \begin{bmatrix}
0.5 & 0.43 & 0 & 0 \\
0 & 0.7 & 0 & 0 \\
0.3 & 0.4 & 0 & 0 \\
1 & 1 & 0 & 1
\end{bmatrix}.
\]

(v) Give any two examples of axonometric projection.

(vi) What is the parametric equations of ellipse :

\[
\frac{(x - 1)^2}{4} + \frac{(y + 2)^2}{9} = 1.
\]

(vii) Write transformation matrix for orthographic projection to 
create bottom view of any object.

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

(i) If the line $y = mx + k$ is transformed to the line 
$y' = m'x + k'$ then show that :

\[
m' = \frac{b + dm}{a + cm}, \quad k' = k\left(\frac{ad - bc}{a + cm}\right).
\]

(ii) Reflect $\triangle ABC$ through the line $y = 5$, where A[1 3], 
B[2 4], C[3 5].

[5216]-203 2
(iii) Obtain combined transformation matrix for the following sequence of transformations:

(a) Reflection through the line $y = -x$.

(b) Shearing in $x$ and $y$ direction by 3 and $-4$ units respectively.

(c) Translation in $x$ and $y$ direction by $-1$ and 2 units respectively.

Further apply this combined transformation on the point $P[3 -8]$.

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

(i) Obtain isometric projection of the line segment between the points $A[1 -2 1]$ and $B[3 1 -6]$, ($\phi > 0$, $\theta > 0$).

(ii) Rotate the line segment $AB$ where $A[3 3 3]$, $B[5 5 5]$ about the local X-axis passing through the point $P[2 3 1]$ through an angle $75^\circ$.

(iii) Find the combined transformation matrix for the following sequence of transformations:

(a) Translate in $x$, $y$ and $z$ direction by $-2$, $-2$, $-2$ units respectively.

(b) Rotate about X-axis by an angle $45^\circ$.

(c) Reduce to half of its size.

[5216]-203 3 P.T.O.
4. Attempt any one of the following:

(i) Obtain equispaced 6 points on the circle:

\[(x - 1)^2 + (y + 2)^2 = 9.\]

(ii) (a) If \(B_0[2 \quad 1], B_1[4 \quad 4], B_2[5 \quad 3], B_3[5 \quad 1]\) are vertices of Be'zier polygon, then determine the point \(P(0.7)\). Also find the first derivative of \(P(t)\) at \(t = 0.3\).

(b) The plane \(x + 2y + 2z = 0\) is to be rotated so that it coincide with \(z = 0\) plane. Determine the required angles of rotation about X-axis and Y-axis.
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) Check, by graphical method that whether the following L.P.P. has the feasible solution :

Maximize : \( z = 4x_1 + 2x_2 \)
Subject to : \( 2x_1 + 3x_2 \leq 18 \)
\[ x_1 + x_2 \geq 10 \]
\[ x_1 \geq 0, \ x_2 \geq 0 \]

P.T.O.
(ii) Find IBFS of the following transportation problem using Least-Cost method:

<table>
<thead>
<tr>
<th>From</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>21</td>
<td>16</td>
<td>25</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>F2</td>
<td>17</td>
<td>18</td>
<td>14</td>
<td>23</td>
<td>13</td>
</tr>
<tr>
<td>F3</td>
<td>32</td>
<td>27</td>
<td>18</td>
<td>41</td>
<td>19</td>
</tr>
<tr>
<td>Demand</td>
<td>6</td>
<td>10</td>
<td>12</td>
<td>15</td>
<td>43</td>
</tr>
</tbody>
</table>

(iii) Solve the following game:

Player A

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>III</td>
<td>6</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>IV</td>
<td>4</td>
<td>2</td>
<td>8</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

(iv) Write the dual of the following L.P.P.:

Maximize: \( Z = 4x_1 + x_2 + 7x_3 \)

Subject to: \( x_1 + x_2 + x_3 = 10 \)

\( 5x_1 - x_2 + x_3 \geq 12 \)

\( x_1 + 7x_2 - 3x_3 \leq 4 \)

\( x_1, x_2, x_3 \geq 0 \)
(v) Define the following terms:
(a) Mixed strategy
(b) Unstable game.

(vi) Convert the following L.P.P. into standard form:
Minimize: \[ Z = 75x_1 + 125x_2 + 150x_3 \]
Subject to:
\[ x_1 + x_2 + x_3 \leq 500 \]
\[ x_1 + x_2 \geq 150 \]
\[ x_1 - x_2 - x_3 = 100 \]
\[ x_1, x_2, x_3 \geq 0 \]

(vii) Define “unbalanced assignment problem.” How do we convert it into balanced assignment problem?

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

(i) Find IBFS of the following transportation problem by VAM and check whether it is an optimal solution:

<table>
<thead>
<tr>
<th>From</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1</td>
<td>8</td>
<td>16</td>
<td>16</td>
<td>152</td>
</tr>
<tr>
<td>O2</td>
<td>32</td>
<td>48</td>
<td>32</td>
<td>164</td>
</tr>
<tr>
<td>O3</td>
<td>16</td>
<td>32</td>
<td>48</td>
<td>154</td>
</tr>
<tr>
<td>Demand</td>
<td>144</td>
<td>204</td>
<td>82</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Write an algorithm to solve assignment problem.
(iii) A company manufactures two products A and B. Product A yields a contribution of ₹ 30 per unit and product B ₹ 40 per unit, towards fixed cost. It is estimated that sales of product A for the coming month will not exceed 20. Sales of product B have not been estimated but the company does have a contract to supply at least 10 units to a regular customer. Machine hours available for the coming month are 100 and products A and B take 4 hours and 2 hours respectively. Labour hours available are 180 and products A and B take 4 hours and 6 hours of labour respectively. Material available are restricted to 40 units and the two products each use one unit of material per unit. Formulate this problem as a L.P.P. to maximize contribution.

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

(i) Solve the following assignment problem:

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>3</td>
<td>9</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
(ii) Solve the following L.P.P. by simplex method:
Maximize: \( Z = x_1 + 4x_2 + 5x_3 \)
Subject to the constraints:
\[
\begin{align*}
3x_1 + 3x_3 &\leq 22 \\
x_1 + 2x_2 + 3x_3 &\leq 14 \\
3x_1 + 2x_2 &\leq 14 \\
x_1, x_2, x_3 &\geq 0
\end{align*}
\]

(iii) Using the principle of dominance, solve the following game:

<table>
<thead>
<tr>
<th>Player B</th>
<th>B_1</th>
<th>B_2</th>
<th>B_3</th>
<th>B_4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_1</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>14</td>
</tr>
<tr>
<td>A_2</td>
<td>10</td>
<td>11</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>A_3</td>
<td>13</td>
<td>12</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>

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

(i) Solve the following L.P.P. by Big-M method:
Minimize: \( Z = 3x_1 + 8x_2 \)
Subject to the constraints:
\[
\begin{align*}
x_1 + x_2 &= 200 \\
x_1 &\leq 80 \\
x_2 &\geq 60 \\
x_1, x_2 &\geq 0
\end{align*}
\]
(ii) (a) Solve the following game by graphical method:

\begin{center}
\begin{tabular}{cccc}
\textbf{Player B} & I & II & III & IV \\
\textbf{Player A} & I & 2 & 2 & 3 & -1 \\
& II & 4 & 3 & 2 & 6 \\
\end{tabular}
\end{center}

(b) Obtain IBFS for the following transportation problem by North-West corner method:

\begin{center}
\begin{tabular}{l|ccccc|c}
\hline
\text{From} & \text{To} & W_1 & W_2 & W_3 & W_4 & W_5 & \text{Supply} \\
\hline
P_1 & 14 & 10 & 9 & 7 & 7 & 800 \\
P_2 & 12 & 8 & 5 & 5 & 7 & 200 \\
P_3 & 9 & 7 & 8 & 6 & 6 & 600 \\
P_4 & 4 & 7 & 9 & 9 & 15 & 100 \\
P_5 & 8 & 9 & 9 & 10 & 16 & 400 \\
\hline
\text{Demand} & 300 & 500 & 300 & 400 & 400 & — \\
\hline
\end{tabular}
\end{center}
Total No. of Questions—4] [Total No. of Printed Pages—3

Seat No.

[5216]-205

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

ELECTRONIC 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) Define step angle of stepper motor.

(b) What is the content of SP register after power-on-reset the 8051 microcontroller?

(c) What is the step size of 8 bit ADC if $V_{\text{ref}}$ is 2.5 V?

(d) List any two logical instructions with proper syntax.

(e) If $A = \text{FF}$, after execution of an instruction CPL A, what are the contents of A?

(f) State the function of $\overline{\text{PSEN}}$ pin of 8051 microcontroller.

P.T.O.
(g) List number of timers used in 8051 microcontroller.

(h) What is the size of address and databus of 8051 microcontroller?

(i) What is the role of 'Gate' bit in TMOD register?

(j) What is the significance of Timer Flag (TF) used in 8051 microcontroller?

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

(a) Explain the function of the following instructions:

(i) CLR A

(ii) mov R0, #40H

(iii) mov A, @ R1

(iv) mUL AB

(v) INC R0

(b) Differentiate between microcontroller and microprocessor.

(c) Draw the diagram of interfacing stepper motor to 8051 microcontroller. Write a 'C' program to rotate the stepper motor.

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

(a) Write a 8051 'C' program to generate 1 KHz square waveform of 50% duty cycle at port pin P2.1. Use timer1 and mode1 with crystal frequency \( X_{\text{TAL}} = 12 \text{ MHz} \).
(b) Explain any five addressing modes used in 8051 microcontroller with suitable example.

(c) Draw block diagram of 8051 microcontroller and explain any three blocks.

4. Attempt any one of the following: [1x10=10]

(A) (a) Explain the interrupts of 8051 microcontroller in brief. [5]

(b) (i) Write any three features of PIC microcontroller. [3]

(ii) Draw bit format of synchronus and asynchronous serial data transmission. [2]

Or

(B) (a) Explain how LED can be interfaced to 8051 microcontroller with neat diagram. Write an assembly program to toggle LED connected to P2.3. [5]

(b) (i) Draw the block diagram of interfacing DAC0808 to 8051 microcontroller. [3]

(ii) Write an assembly language program to add two 8 bit numbers. [2]
S.Y. B.Sc. (Computer Science) (II Sem.) 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) State Nyquist Sampling theorem.
(b) For an amplitude modulated system, maximum amplitude of the envelope is 5 V and minimum amplitude is 2 V, calculate the modulation index.
(c) Define hop time with reference to FHSS.
(d) Give any two examples of half duplex communication system.
(e) Define bandwidth of an antenna.
(f) Draw waveform of FSK for 10101100.

P.T.O.
(g) What do you mean by Multiple Access?

(h) Give the full form of GPRS.

(i) What is base band signal?

(j) Give any two advantages of frequency modulation (FM) over amplitude modulation (AM).

2. Attempt any two of the following: \[2\times5=10\]

(a) Draw and explain the block diagram of electronic communication system.

(b) Draw the circuit diagram of transistorized amplitude modulator and explain its working.

(c) Write any five features of FDMA.

3. Attempt any two of the following: \[2\times5=10\]

(a) Explain CDM (Code Division Multiplexing) system with suitable block diagram.

(b) Explain the need of wireless communication (any five points).

(c) Explain QPSK with respect to the following points:

   (i) Concept

   (ii) Truth Table

   (iii) Phasor diagram.
4. Attempt any *one* of the following: [1×10=10]

(a) (i) Construct Hamming code for data information 1001 with odd parity. [5]

(ii) Explain the Piconet and Scatternet in bluetooth network. [5]

Or

(b) (i) Explain the steps involved in PCM and give any *two* applications of it. [5]

(ii) Give any *three* features of spread spectrum technology. [3]

(iii) What is Hand off concept of mobile communication? [2]
S.Y. B.Sc. (Computer Science) (II Sem.) EXAMINATION, 2017

ENGLISH

(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) Analyse Rosemary Fell's character in the story 'A Cup of Tea'.

(ii) How did the narrator react to the changes made to his features in his photograph ?

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

(i) How did the poor, thin girl react to the invitation of Rosemary Fell ?

(ii) Describe the initial preparations made by the photographer.

P.T.O.
2. (A) Attempt any one of the following in about 100 words: [5]
   (i) How does the poem ‘Ozymandias’ portray the idea that human life and power is temporary?
   (ii) Explain the significance of the title “If”.
(B) Attempt any one of the following in about 100 words: [5]
   (i) What is the central idea of the poem, “Daffodils”? 
   (ii) What are the challenges which a person will have to face in life in the poem “If”?

3. Attempt any two of the following: [10]
   (i) Give 5 tips on techniques you could use to perform well in interviews.
   (ii) Write a short note on the use of visual aids in Presentation.
   (iii) Prepare 5 slides to promote a new mobile phone to be launched in the market.
   (iv) Write a transcript for a Group Discussion on “Global Warming”.

4. Attempt any two of the following: [10]
   (i) Write a review on a new shopping mall in your town.
   (ii) Write a paragraph on “Benefits of Yoga and Meditation”.
   (iii) Write a brief report on “Tree Plantation Week” in your college.
   (iv) Write an essay on “The Problem of city slums”.

[5216]-207 2
(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) “Life changes for a girl, once she starts wearing the Purdah.” Explain the lines with reference to the poem “Purdah”.

(ii) Write a detailed note on Longfellow’s attitude towards life discussed in the poem “A Psalm of Life”.

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

(i) How does the poem “Purdah” bring out the loss of self and ‘objectification’ of women?

(ii) How do the lives of great men affect those around them? Discuss it with reference to the poem “A Psalm of Life”.

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

(i) How does the poem “Ozymandias” portray the idea that human life and power is temporary?

(ii) Discuss the challenges that a person will have to face in life, with reference to the poem ‘If’ .......
(B) Attempt any one of the following in about 100 words: [5]

(i) Explain the significance of the last line of the poem ‘If’ .......

(ii) Discuss “Daffodils” as a nature poem.

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

(i) Ria, Shabana, Anu and Vijay are discussing the impacts of globalization on Indian Culture. Prepare a transcribe of the same.

(ii) Prepare 5 slides on “E-literacy”.

(iii) Frame 5 questions with their responses for an interview of a Data Operator’s job.

(iv) Write a note on the guidelines for making an effective presentation.

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

(i) Develop a paragraph on “Mobile-Madness”.

(ii) Write a review of a book that you have read recently.

(iii) Write a descriptive essay on “My visit to a historical place”.

(iv) Write a report on the “Cleanliness Drive” organized by your college.
T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017
COMPUTER SCIENCE
Paper I
CS-331: System 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.

1. Attempt all: [10×1=10]

(a) What are the different types of debuggers?
(b) Give the declaration statements of assembly language with its syntax.
(c) What are the different types of text representations of line editor?
(d) What is a sequencing symbol? Give one example.
(e) Define interpreter.
(f) What is a relocatable loader?
(g) Give any four file system related system calls.
(h) Timer is used by operating system to control the CPU.

(True or False)

P.T.O.
(i) Give any two advantages of multiprocessor systems.
(j) What is the use of ORIGIN statement?

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

(a) Write a brief note on synthesis phase of an assembler.
(b) What is program relocatability?
(c) For the following code show the contents of Symbol Table, Literal Table and Pool Table:

```
START    200
MOVER    AREG, = '5'
MOVEM    AREG, A
LOOP      MOVER    AREG, A
          MOVER    CREG, = '1'
          ORIGIN   210
          LTORG
NEXT      SUB       AREG, = '1'
BC        LT, BACK
LAST      STOP
          ORIGIN   LOOP + 2
MULT      CREG, B
          ORIGIN   LAST + 1
A         DS        1
BACK      EQU       LOOP
B         DS        1
END
```

[5216]-301 2
3. Attempt any two of the following: [2x5=10]

(a) Write a note on process management and memory management.

(b) What is macro expansion? Explain in detail the types of macro expansion.

(c) Consider the following macro:

```
MACRO
EVAL    &X, &Y, &Z, &REG = BREG
LCL     &P
&P SET  5
MOVER  &REG, &X
SUB     &REG, &Y
ADD     &REG, &Z
AIF     (&Y EQ &X) • ONLY
AGO • OVER
• ONLY MOVER &REG, &Z
• OVER MEND
```

Show the contents of the following data structure:

(i) MNT

(ii) MDT

(iii) PNTAB

(iv) KPDTAB

(v) EVNT B
4. Attempt either (A) or (B):

(A) (a) Write a brief note on strip utility and make utility. [4]
(b) Explain structure editor and stream editor as an editor. [4]
(c) Write any two advantages of compiler over interpreter. [2]

Or

(B) (a) What is a Translated origin, Linked origin, Load origin and Load time address? [4]
(b) Differentiate between System program and Application program. [4]
(c) Write a note on system call parameter passing. [2]
T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

CS-332 : Theoretical Computer Science

(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 : [10×1=10]

(a) Write regular expression for the set of all strings of a’s and b’s ending with ab over Σ = {a, b}

(b) Define suffix of a string. Give one example.

(c) “DFA cannot have more than one final states.” Justify.

(d) Write output function λ of Moore and Mealy machines.

(e) Write any two closure properties of regular expression.

(f) Define ambiguous grammar.

(g) Name the type of languages accepted by Pushdown Automata.

(h) Define non-deterministic Turing Machine.

P.T.O.
(i) What is unit production?

(j) Consider the following grammar:

\[ S \rightarrow ADa \]
\[ A \rightarrow a \]
\[ D \rightarrow d \]

The grammar is in CNF. Justify.

2. Attempt any two of the following: \([2 \times 5 = 10]\)

(a) Convert the following grammar in GNF:

\[ S \rightarrow aAS | a \]

\[ A \rightarrow SbA | SS | bA \]

(b) Construct DFA to accept substrings having both \(aa\) and \(bb\) over \(\Sigma = \{a, b\}\).

(c) Construct PDA for language:

\[ L = \{a^mb^n | m > n \geq 1\} \]

3. Attempt any two of the following: \([2 \times 5 = 10]\)

(a) Convert the following NFA to DFA:

![Diagram](image_url)
(b) Construct Turing Machine for language :
\[ L = \{ a^n b^n a^n | n \geq 1 \} \]

(c) Minimize the following DFA using Myhill-Nerode theorem :

4. (a) Construct Moore and Mealy machines which outputs valid for valid strings and invalid for invalid strings for language
\[ L = a(a + b)^* b. \]  
[4]
(b) Construct NFA for regular expression \( 1.0^* + 0^*.1. \)  
[3]
(c) How to apply pumping lemma to prove certain languages are non-regular ?  
[3]

Or

(a) Construct CFG for the language \( L = L_1 L_2 \) where :  
[4]
\[ L_1 = \{ a^n b | n \geq 0 \} \]
\[ L_2 = \{ b^m c | m \geq 0 \}. \]
(b) Write a short note on Chomsky’s hierarchy. [4]

(c) Consider the following grammar:

\[ S \rightarrow AB | aD | a \]
\[ A \rightarrow a \]
\[ D \rightarrow aD | aDD \]

Remove useless symbols and rewrite the grammar. [2]
T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper III

CS-333 : Computer Networks-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) Use of calculators, log tables is allowed.

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

   (a) Define Home Networks.

   (b) List two similarities between TCP/IP and OSI model.

   (c) What is the purpose of twisting wires in twisted pair cables ?

   (d) What is distortion ?

   (e) What is meant by Hamming Distance ?

   (f) State the strategies used to avoid collisions.

   (g) What is Manchester encoding ?

P.T.O.
(h) What is Pipelining?

(i) Draw the Differential Manchester Encoding for the 00110011 data stream.

(j) For $n$ devices in a network, what is the number of cables required for ring topology?

2. Attempt any two of the following: \[2\times5=10\]

(a) Explain the OSI reference model in detail.

(b) Explain the packet switching with advantages and disadvantages.

(c) Describe the functions performed by Data Link Layer.

3. Attempt any two of the following: \[2\times5=10\]

(a) Write in detail about simplex, half duplex and full duplex data communication.

(b) Write a note on Infrared wireless transmission.

(c) Consider a CDMA scheme with 3 stations having chip sequences $[+1\ -1\ +1\ -1]$, $[+1\ +1\ -1\ -1]$ and $[+1\ +1\ +1\ +1]$. Station 1 sends bit 1. Station 2 sends bit 0. Station 3 is silent. Show the process of encoding and decoding along with the signals.
4. Attempt any one of the following (A or B) : [1x10=10]

(A) (a) Calculate the bit rate for a channel having bandwidth 2000 Hz if :

(i) S/N ratio is 0 dB
(ii) S/N ratio is 20 dB. [4]

(b) Describe Pure and Slotted ALOHA in brief. [4]

(c) The stop and wait protocol always accepts frames in order. Comment. [2]

Or

(B) (a) Discuss Attenuation and Distortion in detail. [4]

(b) Draw and explain the frame format of PPP. [4]

(c) Explain the terms de facto and de jure. [2]
T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper IV

CS-334 : Internet Programming I

(2013 PATTERN)

Time : Two Hours  
Maximum Marks : 40

N.B. :—  
(i) All questions are compulsory.
(ii) All questions carry equal marks.

1. Attempt the following :  

   (a) State the advantages of PHP.
   (b) How to check if given variable is Array or not ?
   (c) What is the difference between == and === ?
   (d) What will be output of the following :

         <?php
         $a = "K9";
         $a++;
         echo $a;

         ?>
   (e) What is the difference between echo( ) and print( ) functions ?
   (f) How to Insert and Remove the last element of an array ?

P.T.O.
(g) What is interface?

(h) State the purpose of $this variable.

(i) Write the purpose of rewind( ) function.

(j) “Keywords are case sensitive in PHP”. Justify True or False.

2. Attempt any two of the following: [2x5=10]

(a) What is Data type? List different Data types in PHP? Explain any two.

(b) What are the different class methods and object methods available in PEAR DB library? Explain.

(c) What is associate array? Explain with suitable example how it different from indexed array. Explain foreach( ) function.

3. Attempt any two of the following: [2x5=10]

(a) Explain the following functions with syntax and example:

   (i) Func_num_args( )

   (ii) Var_dump( )

   (iii) Print_r( )

   (iv) Soundex( )

   (v) strpos( )

(b) Explain ereg( ) function. List and explain (any three) with example special character used in regular expression.

(c) Write a PHP script to accept directory name and display the contents in table format.
4. Attempt any one (either A or B) of the following:

(A) (a) Explain the following functions with respect to Array: [4]
      (i) Extract( )
      (ii) Shuffle( )
      (iii) Array_splice( )
      (iv) Arsort( )

      (b) Consider the following relational database: [4]
          Movie(Movie_no, Movie_name, Year)
          Actor(Actor_no, Actor_name, Movie_no)

          Write a php script which accept Movie_name and display actors acted in same movie.

      (c) Explain variable function concept in PHP. [2]

      Or

(B) (a) Explain the following functions with example: [4]
      (i) Fgets( )
      (ii) Flock( )
      (iii) File( )
      (iv) Filetime( )

      (b) Write a short note on Introspection. [4]

      (c) Write an anonymous function to maximum of two numbers. [2]
T.Y. B.Sc. (Computer Science) (III Sem.) 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 are packages ?
   (b) Name the method and interface to create an identical copy of an object.
   (c) Give difference between throw and throws.
   (d) Justify True/False : Java is not fully object oriented.
   (e) What will be the output of the following statement ?
       Justify :
       
       system.out.println(35+40+975+“Are Integers”).
   (f) Write two types of nested classes.
   (g) What is the use of Adapter class ?
(h) Define an Applet.

(i) Which stream is used to read primitive data from file?

(j) Give two types of Dialogs.

2. Attempt any two of the following: [2x5=10]
   (a) Explain the process of compilation of a Java program.
   (b) Create two packages, pack1 contains two classes as student & course. Both classes have method to read corresponding Information. Pack2 contains class college with method accept( ). Write a java program to display all information.
   (c) Explain in brief the event handling mechanism in java with the help of suitable example.

3. Attempt any two of the following: [2x5=10]
   (a) Create an abstract class Employee. Derive two classes manager and worker from it. Use proper method to accept and display the details for the same. The fields of manager are mid, mname and phno. Similarly, fields for worker are name and working hours.
   (b) Write a java program to delete all the files from the current directory having extension as .doc also display the count number of .doc files deleted separately.
   (c) Explain the Applet Life Cycle.
4. Attempt any one (either A or B) of the following:

(A) (a) Write a java program which stores the username and password in two variables. If username and password are not same, then raise "Invalid password" with appropriate message. [5]

(b) Explain any 3 methods of the Input Stream Class. [3]

(c) List any two names of Wrapper Class. [2]

Or

(B) (a) Explain how the input is accepted from command line with the help of program. [5]

(b) Explain the use of keywords super and final with reference to inheritance. [3]

(c) What are the features of swing? [2]
T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper VI

CS-336 : Object Oriented Software Engineering

(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.

(iv) Neat diagrams must be drawn wherever necessary.

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

(a) “Classes may be called as object type.” State True/False and justify.

(b) “UML supports both static and dynamic modeling.” State True/False and justify.

(c) Define the object “Saving Bank Account” with possible attributes and operations with visibility.

(d) Define Leaf Class.

(e) What is meant by stereotypes ?

P.T.O.
(f) Name any two phases of Iterative development process.

(g) Name the types of diagram used by Booch’s method in implementation level.

(h) What is use of component diagram?

(i) What is acceptance testing?

(j) Define Fork.

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

   (a) What is Modeling? Explain any two types of model.

   (b) Write a note on Rumbaugh method.

   (c) Write similarities and difference in sequence and collaboration diagram.

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

   (a) What is use of deployment diagram? Explain it with suitable diagram.

   (b) Explain stress and volume testing.

   (c) Draw the class diagram for stack and queue implementation using linked list.

4. Attempt the following:

   (A) A system is to be designed for a travel company for computerizing their booking. They have coaches running on different routes,
each has a start and destination and several stop overs. A customer booking can be done from any stop to any other stop in a group or as individual and charges are according to routes.

Compay has offices in every city where the booking clerk handles the cash. Customer can check the availability and also cancel the booking, get appropriate refund according to the rules. Consider above case and draw the following diagrams:

(i) Draw activity diagram. [3]

(ii) Draw sequence diagram. [4]

(B) How test cases are designed for object oriented software? [3]

Or

For an automated vending machine for Coffee/Tea, a customer deposits a coin, select Coffee/Tea and get proper quantity of it from a machine. Draw a state transition diagram for the same. [3]
T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

(CS-341 : Operating Systems)

(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 are compulsory.

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

   (a) List any two operating system examples that uses one to one model.

   (b) What will happen if all processes are I/O bound in system?

   (c) List any four benefits of virtual machine.

   (d) Give any four criteria for computing various scheduling algorithms.

   (e) Which two standard atomic operations can access semaphore value ?

   (f) What is rollback ?

   (g) Define Re-entrant code.
(h) Define acyclic graph directory.

(i) What is the advantage of paging with segmentation model.

(j) Give examples of operating system with user pthread.

2. Attempt any two of the following:  [5x2=10]

(a) What is context switching? State conditions when context switching occur.

(b) Consider the following set of processes CPU time given in milliseconds:

<table>
<thead>
<tr>
<th>Process</th>
<th>Burst time</th>
<th>Arrival time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>P2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>P3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>P4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>P5</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

Illustrate the execution of these processes using FCFS and preemptive SJF CPU scheduling algorithm.

(c) Consider a system with four processes P1, P2, P3, P4, and four resource types A, B, C, D with one instance of each type. Resource ownership is as follows:

P1 holds A and wants C
P2 holds B
P3 holds D and wants B
P4 holds C and wants D.

Is system deadlock? (Draw resource allocation graph and wait-for graph.)
3. Attempt any two of the following: [5x2=10]
   
   (a) What is critical section problem? How is it solved?
   
   (b) Explain in brief indexed file allocation methods with advantages and disadvantages.
   
   (c) What is fragmentation? Explain internal and external fragmentation in detail.

4. Attempt any one (A or B): [1x10=10]

   (A) (i) Explain multilevel queue scheduling with diagram. [4]
   
   (ii) Consider the following page reference string:
   
   7, 5, 6, 2, 9, 5, 7, 6, 2, 7, 6, 5, 2, 7, 2, 7, 8
   
   How many page faults will occur for the following page replacement algorithms? Assume 3 frames:
   
   (a) FIFO
   
   (b) Optimal Replacement. [4]
   
   (iii) State two benefits of multithreaded programming. [2]

   Or

   (B) (i) Explain different file access methods. [4]
   
   (ii) How the system is prevented from deadlock? [4]
   
   (iii) What is the main function of microkernels? [2]
T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

(CS-342 : Compiler Construction)

(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.

(iv) Neat diagrams must be drawn wherever necessary.

1. Attempt all of the following : [10x1=10]

(a) State True or False. Target code is generated in analysis phase of a compiler.

(b) Define Parse Tree.

(c) List any two LEX Library functions.

(d) Which one is the most powerful parser in Bottom up parsers?

(e) Computer FIRST for the following productions :

\[ S \to AB|Ad \]
\[ A \to aA|\epsilon \text{ (epsilon)} \]
\[ B \to bB|\epsilon \text{ (epsilon)} \]

P.T.O.
(f) Define the term inherited attribute.

(g) State True or False: Three address code is used in intermediate code generation.

(h) Define static memory allocation.

(i) What is the use of Directed Acyclic Graph (DAG)?

(j) Define the term Basic block.

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

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

\[
S \rightarrow aAb|Sa \\
A \rightarrow Ab|b.
\]

(b) For the input expression \(10 \times 9 \times 8 \times (7 + 6)\), design SDD and draw annotated tree using the following grammar:

\[
L \rightarrow E \\
E \rightarrow E_1 + T|T \\
T \rightarrow T_1 \times F|F \\
F \rightarrow (E)|digit
\]

(c) Write a LEX program of find sum of first \(n\) numbers.

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

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

\[
S \rightarrow SeB|eA \\
A \rightarrow AaB|B \\
B \rightarrow bB|\varepsilon (epsilon).
\]
(b) Construct Directed Acyclic Graph (DAG) for the following expression:

(i) \((a + a \ast (b - c) + (b - c) \ast d)\)

(ii) \((a + b) \ast (a + b)\).

(c) Differentiate between one pass compiler and two pass compiler.

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

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

\[
S \rightarrow aAb | aBb | aAd
\]

\[
A \rightarrow dS | d
\]

\[
B \rightarrow e
\]

(ii) Write a short note on displays with the help of a diagram. [4]

Or

(B) (i) Check whether the given grammar is LALR(1) or not: [6]

\[
S \rightarrow <L>|a
\]

\[
L \rightarrow L,S | S.
\]

(ii) Construct triples and quadruples for the following expression

\((a + b) \ast (m - n) \uparrow (m + n)\). [4]
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) Black figures to the right indicate full marks.
(iv) All questions carry equal marks.

1. Attempt all of the following :  

(a) Why CSMA/CD is not required in full duplex switched ethernet ?
(b) What is multicasting ?
(c) State any two applications of wireless LAN.
(d) What is fragmentation ?
(e) What is the purpose of RARP ?

P.T.O.
(f) State any two applications of UOP?

(g) Which file types can be transferred on FTP?

(h) What is packet filter?

(i) By using substitution cipher transform the message "HONESTY IS THE BEST POLICY" key is -5.

(j) State the class of the following IP address:
    128.89.0.26.

2. Attempt any two of the following: [2\times 5=10]

   (a) Explain in detail 802.3 MAC frame format.

   (b) Compare and contrast FTP and HTTP.

   (c) Explain open and closed loop congestion control mechanism.

3. Attempt any two of the following: [2\times 5=10]

   (a) Explain stream delivery service and sending and receiving buffer service of TCP.

   (b) By using transposition cipher convert the following:
       Plain text: "The application layer is the topmost layer in layered network model."
       Key: MEGABUCK.

   (c) Discuss four different cases required for services of ARP.
4. Attempt A or B of the following:

(A) (i) Explain two fundamental cryptographic principles. [4]

(ii) Explain Bus and Star Backbone network with diagram. [4]

(iii) Write any two applications of bluetooth technology. [2]

Or

(B) (i) Explain adaptive and non-adaptive routing algorithms. [4]

(ii) Explain the concept of multiplexing and demultiplexing used in process to process delivery. [4]

(iii) Explain in brief Java applet security. [2]
T.Y. B.Sc. (Fourth Semester) EXAMINATION, 2017

COMPUTER SCIENCE

Paper IV

(CS : 344 Internet Programming-II)

(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 are ‘automatic globals’ variables in PHP ? List any four.

(b) List the features of HTTP.

(c) What is XML parser ?

(d) Write the special operators used in Javascript.

(e) Give any two applications of Ajax.

P.T.O.
(f) What are the advantages of DHTML?

(g) What is DOM?

(h) List the items available in the $FILES$ array.

(i) Which object is used by Ajax to make webpage interactive?

(j) How we can get the cookie values and destroy the cookies?

2. Attempt any two of the following: \[5 \times 2 = 10\]

(a) Explain different methods used to maintain state in PHP.

(b) Discuss the advantages and disadvantages of IMAP4 protocol.

(c) Explain the working of Ajax in detail.

3. Attempt any two of the following: \[5 \times 2 = 10\]

(a) Write a PHP script to accept Employee details like name, department and emp id. Once the employee information is accepted then accept Loan information like loan no, loan amt, loan premium, loan type etc. Display employee details and loan details on the new page.

(b) Write a Javascript that accept a string from user. Pass this string as parameter to a function ‘Check-Vowel’ on button click event and return the count of the number of vowels within the string.
(c) Write a script to create XML file ‘breakfast.xml’. The element details of breakfast.xml are as follows:

```xml
<breakfast menu>
  <food>
    <name> .............. </name>
    <price> .......... </price>
    <description> ............ </description>
    <calories> ................. </calories>
  </food>
</breakfast menu>
```

Link breakfast.xml file to breakfast.css & Get well formatted output as:

Name, Price → Color: Red; Font-family: Arial; Font-size: 15 pt;

Description, calories → Color: Blue; Font-family: Bodoni MT;
font-size: 12 pt;

4. Attempt any one (A or B): [2×5=10]

(A) (i) Explain advantages of XML over HTML.

(ii) Write a HTML form to accept student name, age and mobile no. from user. Using Javascript validate the following:
    (a) Student name should not be empty
    (b) Age must be in between 16 to 21.

Or

(B) (i) Explain how email attachment is send with PHP.

(ii) Write a PHP script by using multivalued parameter-check boxes, select list of subjects and display it on next page by using sticky forms.
T.Y. B.Sc. (IV Sem.) 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 marks.
(ii) All questions are compulsory.
(iii) Figures to the right indicate full marks.

1. Attempt all of the following :  

(a) Which packages are required for Java Database connectivity?
(b) State constructors of Treeset class.
(c) Explain the purpose of join method in the context of threads.
(d) What is the use of page directives in JSP?
(e) List any two constructors of URL class.
(f) Write any two methods to obtain and store information from http session object.
(g) List the parameters of the dopost method in servlet.
(h) What is purpose of Rollback( ) in transactions in Java database connectivity?
(i) Give two differences between Multithreading and Multitasking.
(j) List any four implicit objects defined by JSP.

P.T.O.
2. Attempt any two:

(a) Write a servlet program that accept teacher id, name and subject and also print the same.

(b) What is use of the following in Jdbc?
   (i) execute()
   (ii) execute update()
   (iii) execute query()
   (iv) statement()
   (v) prepared statement()

(c) Write a program to display “examination” 50 times using Multithreading.

3. Attempt any two:

(a) Explain Servlet Lifecycle with the help of a diagram.

(b) Write a JDBC program to read, update any record from database. Database about element Oxygen and Hydrogen has the following fields: (Atomic weight, name, chemical symbol). The input should provided through command line. e.g.:

   Java pgm_name R

   will Read & show the contents of the table.

   Java pgm_name U 10 ‘oxygen’ 137

   will update the record according to the name specified.

(c) Write a program that uses Hashtable for storing and retrieving student records, (Containing Name and Percentage) Display the details of students having highest percentage.
4. Attempt any one (either A or B) of the following:

(A)  
(a) Explain the server socket class and socket class in Java. Also state the methods of both classes. [4]

(b) Write a JSP program which takes Multiplicand and Multiplier from user as input and after clicking on “Multiply” button it will display Multiplicand, *, Multiplier and Product. [4]

(c) Differentiate between doget() and dopost() methods. [2]

Or

(B)  
(a) Explain scripting elements in JSP. [4]

(b) What is Cookie? How to set cookies explain with example. [4]

(c) What is ResultSet Interface? List any two methods. [2]
T.Y. B.Sc. (IV Sem.) EXAMINATION, 2017
COMPUTER SCIENCE
Paper VI
CS-346 : Computer Graphics
(2013 PATTERN)

Time : Two Hours  
Maximum Marks : 40

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

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

   (a) What is raster ?
   (b) What is use of a data glove ?
   (c) Name the method used in OpenGL to set viewport.
   (d) Define point.
   (e) Name any two output devices.
   (f) Why are need to do clipping operation ?
   (g) State any two applications of computer graphics.
   (h) Explain point clipping.
   (i) List any two OpenGL libraries.
   (j) State any four OpenGL data types.

P.T.O.
2. Attempt any two:

(a) General points only for one octant of circle with centre (2, 3) and radius 10 using midpoint circle generation algorithm.

(b) Calculate final coordinates for point P(4, 5) after the following 2D transformations:

(i) Translate with \( t_x = 3 \) and \( t_y = 3 \)
(ii) Rotate with angle 30°.

(c) Calculate final coordinates for point P(3, 3, 3) after the following 3D transformations:

(i) Rotate with angle 90° along X-axis
(ii) Reflect along XY plane.

3. Attempt any two:

(a) Explain Bresenham's line drawing algorithm for \(|m| < 1\).

(b) Write a note on “colour mask in CRT”.

(c) How 2D transformations are carried out on parallel lines?

4. Attempt (A or B):

(A) (a) Explain Weiler Atherton clipping algorithm. (4)

(b) How characters are stored and displayed? (4)

(c) Discuss keyboard interaction in OpenGL. (2)

Or

(B) (a) How BSP trees are used for hidden surface elimination in detail? (4)

(b) Explain Sutherland Hodgeman polygon clipping algorithm. (4)

(c) What are locator type devices? Give any two examples. (2)