Total No. of Questions—5]   [Total No. of Printed Pages—3

Seat
No.   **[5316]-1**

F.Y. B.Sc. (Computer Science) EXAMINATION, 2018
COMPUTER SCIENCE
Paper-I
CS-101 : Problem Solving using Computers 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.

1. Attempt *all* of the following :   [10×1=10]
    (*a*) What is a compiler ?
    (*b*) Explain ones complement operator with example.
    (*c*) Define flowchart.
    (*d*) Give any *two* limitations of an array.
    (*e*) Which standard input-output library functions are used for string input and output respectively ?
    (*f*) What is the scope of a variable ?
    (*g*) What is the newline character ?
    (*h*) State the use of fopen() function.
    (*i*) Define Macro.
    (*j*) What is dynamic memory allocation ?

2. Attempt any *four* of the following :   [4×5=20]
    (*a*) What are command line arguments ? Explain.
    (*b*) Explain *two* methods of passing arguments to function with example.

P.T.O.

(c) What is an identifier ? Give the rules of identifier.

(d) Differentiate between structure and union.

(e) Explain the following functions with proper syntax :

(1) fflush( )

(2) remove( )

(3) rename( )

(4) ftell( )

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

(a) Differentiate between if-else and switch statement.

(b) Write an algorithm and draw a flowcahrt to find the maximum of 3 no's.

(c) Find the output of the following program and justify :

```
main( )
{    int x = 100;
     printf ("\n x = %d", 10 + x++);
     printf ("\n x = %d", 10 + ++x);
}
```

(d) Find and justify the output of the following program :

```
main( )
{    int x [25];
     x[0] = 100;
     x[24] = 400;
     printf ("\n %d %d", *x, *(x + 24) + * (x + 0));
}
```

(e) Find and justify the output of the following program :

```
main( )
{    int i;
     for (i = 0; i < 5; i++)
     func1( );
}
```

```
func1( )
{     static  int  count  =  0;
      count  =  count  +1;
      printf  ("%d  \t",  count);
}
```

4. Attempt any *four* of the following :   [4×5=20]
    (*a*) Write a 'C' program to accept a number and check whether
           it is an Armstrong number.
    (*b*) Write a 'C' program to accept a m×m matrix and display the
           sum of diagonal elements of the matrix.
    (*c*) Write a 'C' program to accept 'n' numbers and print the even
           numbers.
    (*d*) Write a 'C' program to display the following pattern :

        A
        B   C
        D   E   F
        G   H   I   J

    (*e*) Write a 'C' program for creating a structure employee with
           employee number, employee name and salary. Accept details
           of *n* employees and display the employee details having the
           highest salary.

5. Attempt any *two* of the following :   [2×5=10]
    (*a*) Explain for loop with example.
    (*b*) Explain any *four* string handling functions with usage.
    (*c*) Explain any *two* storage classes with proper example.

Total No. of Questions—4] [Total No. of Printed Pages—3

S.Y. B.Sc. (Sem. I) EXAMINATION, 2018

COMPUTER SCIENCE

(CS-211: Data Structure Using 'C')

(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*) Define omega (Ω) notation.

(*b*) List any methods of representing graphs.

(*c*) What is worst and best time complexity of merge sort ?

(*d*) Define Degree of the tree.

(*e*) Write node structure for a Doubly Circular Linked List.

(*f*) Write any *two* applications of Queue.

(*g*) List different operation of stack.

(*h*) "A Linked List can only be traversal sequentially". State True/ False.

(*i*) List any *two* applications of graph.

(*j*) What is ADT ? What are the advantages of ADT ?

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

    (*a*)   Write a non-recursive 'C' function to insert an element in a Binary Search Tree.

    (*b*)   Write a 'C' function to display even element (data) in a single linked list of integer.

    (*c*)   Write a 'C' function to ADD and REMOVE elements from circular queue implemented using array.

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

    (*a*)   Sort the following elements using Insertion Sort (write passes) :

        23, 6, 18, 29, 27, 4, 13

    (*b*)   Construct the AVL tree for the following data :

        SUN, FRI, MON, WED, TUE, THUR, SAT

    (*c*)   Consider the following graph :
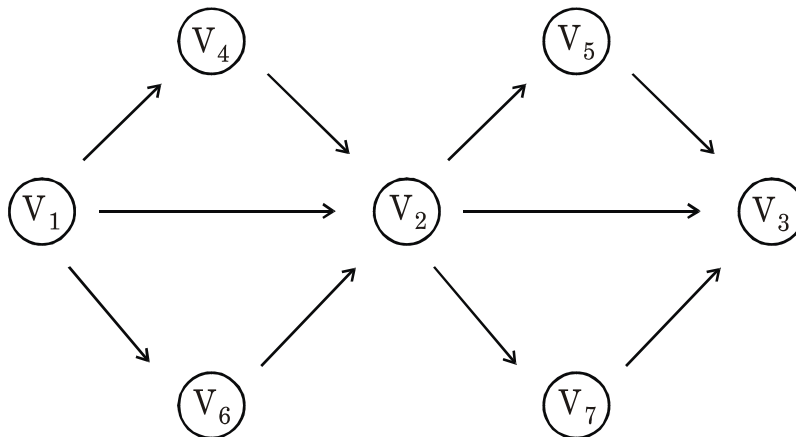
    Starting Vertex = V_1

    (*i*)   Draw the Adjacency List.

    (*ii*)   Give DFS and BFS traversal.

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

   (A) (*a*) Convert the infix expression : [4]

            A | B $ C + D * E − A * C

          to postfix notation show the stack contents.

      (*b*) Write the steps for creating a Binary search tree for the following data : [3]

            15, 11, 13, 8, 9, 18, 16

      (*c*) Define Priority Queue. Explain its types. [3]

   (B) (*a*) Define the following terms : [4]

         (*i*)   Double Ended Queue

         (*ii*)   Critical Path

         (*iii*) Skewed Binary Tree

         (*iv*) Complete Graph.

      (*b*) Write an algorithm for Binary search. [3]

      (*c*) Give the output of the following sample code : [3]

```
initstack (s)
push (s, 9);
push (s, 4);
i = pop (s);
while (i > 0)
{
    push (s, i*i);
    i − −;
}
while (! stack empty (s))
printf("%d\n", pop (s));
```

Total No. of Questions—4]　　　　[Total No. of Printed Pages—4

Seat
No.

[5316]-102

S.Y. B.Sc. (Sem. I) EXAMINATION, 2018
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*) *All* questions carry equal marks.

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

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

(*i*) Define transitive functional dependency.

(*ii*) State difference between varchar and text data type of postgresQL.

(*iii*) What is view ?

(*iv*) Define term Trigger.

(*v*) Define term Serial Schedule.

(*vi*) What is time stamp ?

(*vii*) Define system log.

(*viii*) Define cascading rollback.

(*ix*) Define term Cursor.

(*x*) State purpose of commit statement.

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

(*i*) What is transaction ? Explain ACID property of transaction.

(*ii*) Explain client-server Architecture.

(*iii*) Write a short note on Mandatory Access Control method.

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

(*i*) The following is a list of events in an interleaved execution of set of transaction T_1, T_2, T_3, T_4, T_5 with two phase locking protocol :

Time	Transaction	Code
t_1	T_1	Lock (A, X)
t_2	T_2	Lock (B, X)
t_3	T_3	Lock (E, S)
t_4	T_4	Lock (B, X)
t_5	T_5	Lock (A, X)
t_6	T_4	Lock (A, X)
t_7	T_1	Lock (B, X)
t_8	T_5	Lock (D, X)
t_9	T_3	Lock (A, S)
t_{10}	T_2	Lock (D, X)

(*ii*) The following is log entries at time of system crash :

[Start – Transaction, T_1]

[Write, T_1, A, 40]

[Start – Transaction, T_2]

[Write, T_2, B, 80]

[Start – Transaction, T_3]

[Write, T_3, C, 100]

[Commit, T_2]

[Commit, T_1]

[Checkpoint]

[Start-transaction, T_4]

[Write, T_4, A, 200]

[Write, T_3, E, 10] → System Crash.

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

(*iii*) Consider the following non-serial schedule :

T_1	T_2	T_3
Read (A)		
	Write (A)	
Write (A)		
		Write (A)

Is this schedule conflict serializable ?

Is this schedule view serializable ?

Justify your answer.

If it is serializable, give its equivalent serial schedule.

4. Attempt either A *or* B :

(A) (*i*) Write a short note on Thomas Write Rule. [5]

(*ii*) What is stored procedure ? Give syntax to create stored procedure. [2]

(*iii*)   Consider the following entities and relationships   [3]

Student (rollno, name, address, class)

Subject (code, subjectName, teacherName)

Stud-sub (rollno, code, marks)

Define a trigger before insert for every row as a student, subject table, wheneven marks entered is < 0 or > 100, Raise an application error and display corresponding message.

Or

(B)   (*i*)   Explain timestamp based protocol.   [5]

(*ii*)   What is Trigger ? Explain with syntax.   [2]

(*iii*) Consider the following relational database :   [3]

Doctor (dno, dname, dcity)

Hospital (hno, hname, hcity)

doc-hosp (dno, hno)

Write a function to return count of number of hospitals located in 'Ahmednagar' City.

[5316]-103

S.Y. B.Sc. (Computer Science) (Sem. I) EXAMINATION, 2018

MATHEMATICS

Paper I

(MTC-211 : Applied Algebra)

(2013 PATTERN)

Time : Two Hours   **Maximum Marks : 40**

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

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

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

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

(*i*)   Define a subspace S of a vector space V. Give *one* example.

(*ii*)   State True *or* False :

The set of vectors $\{(0, 1, 2), (0, 2, 3), (0, 3, 1)\}$ in $\mathbf{R}^3$ is a basis of $\mathbf{R}^3$.

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

$$T(x_1, x_2, x_3) = (x_1 + x_2 + x_3 - x_2 + x_3).$$

Find ker(T).

(*iv*) Let $T : M_{2 \times 2} \longrightarrow \mathbf{R}^2$ be a map defind as :

$$T\left(\begin{bmatrix} a & b \\ c & d \end{bmatrix} \right) = (2a - b - d,\ 0).$$

Show that T is a linear transformation.

(*v*) Write the quadratic form of the matrix $\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix}$ by using

the variables x and y.

(*vi*) Determine if the matrix $A = \begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix}$ is diagonalizable or not.

Justify your answer.

(*vii*) If eigenvalues of a matrix A are 1, 2, 3, then find eigenvalues
of A^{-1} and A^3.

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

(*i*) Show that the vectors :

$$\overline{v_1} = (1, 2, 3),\quad \overline{v_2} = (0, 0, 1),\quad \overline{v_3} = (0, 1, 2)$$

span $\mathbf{R}^3$.

(*ii*) Find the matrix P that diagonalizes the matrix $A = \begin{bmatrix} 1 & 0 \\ 6 & -1 \end{bmatrix}$.

(*iii*) Find a basis and dimension of the solution space of the following
system of linear equations :

$$x + 2y - 3z + 2w = 0$$
$$2x + 5y - 8z + 6w = 0$$
$$3x + 4y - 5z + 2w = 0.$$

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

(*i*) Let $T : \mathbf{R}^3 \longrightarrow \mathbf{R}^4$ be a linear transformation which is multiplication by the matrix :

$$A = \begin{bmatrix} 1 & -2 & 4 \\ -1 & 0 & 3 \\ -3 & 4 & -5 \\ 0 & 1 & 0 \end{bmatrix}$$

Find the basis for range of T. Hence find rank and nullity of T.

(*ii*) Find eigenvalues and eigenvectors of the matrix A, where

$$A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}.$$

(*iii*) Find group code $e_H : B^3 \longrightarrow B^6$ corresponding to parity check matrix H :

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

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

    (*i*)   (*a*)   Identify the type of each of the following quadratic forms :

$$2x_1^2 + 2x_2^2 + 2x_3^2 + 2x_1 x_2$$

and $2x_1 x_2 + 2x_2 x_3 + 2x_1 x_3$.

        (*b*)   Apply RSA method to encode the message "BE", where $p = 23$, $q = 41$ and $s = 41$.

    (*ii*)   (*a*)   Let $e_H : B^2 \longrightarrow B^5$ be the encoding function defined as :

$e(00) = 00000$, $e(01) = 01110$, $e(10) = 10101$, $e(11) = 11011$.

Decode the following words relative to maximum likelihood decoding function where :

$$x_t = 11110 \text{ and } x_s = 10011$$

        (*b*)   Prove that a set S with two or more vectors is linearly dependent if and only if at least one of the vectors is expressible as a linear combination of the other vectors in S.

[5316]-103

[5316]-103   4

Total No. of Questions—**4**]   [Total No. of Printed Pages—**3**

Seat
No.

[5316]-104

S.Y. B.Sc.   (First Semester) EXAMINATION, 2018

COMPUTER SCIENCE

Paper-II

MTC-212 : Numerical Analysis

(2013 PATTERN)

Time : Two Hours   Maximum Marks : 40

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

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

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

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

(*i*)   Define relative error and percentage error.

(*ii*)   Write the Newton-Raphson formula for square root of any real number.

(*iii*)   With usual notation, show that $E \nabla = \Delta$.

(*iv*)   Write Bessel's interpolation formula for central difference.

(*v*)   State trapezoidal rule for numerical integration.

(*vi*)   State Euler's Maclaurin's formula for numerical integration.

(*vii*)   Given that $Y' = X + Y$ with $Y(0) = 1$.

Find Y(0.1) by Euler's method.

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

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

(*ii*) Find the best approximate real root of the equation $x^3 - 9x + 1 = 0$ using Regula-falsi method. Take interval (2, 3).

(*iii*) Given $y(1) = -3$, $y(3) = 9$, $y(4) = 30$ and $y(6) = 132$, find polynomial by Lagrange's interpolation formula.

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

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

(*ii*) Given $y(1) = 3$, $y(3) = 31$, $y(6) = 223$ and $y(10) = 1011$, $y(11) = 1343$. Obtain $y(8)$ by using Newton's divided difference formula.

(*iii*) Evaluate $\int_0^1 \dfrac{1}{1+x^2}\, dx$ by using Simpson's $\dfrac{1}{3}$rd rule (Take $h = 0.1$).

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

(*i*) Given that $\dfrac{dy}{dx} = y - x$ with $y(0) = 2$.

Find $y(0.1)$ and $y(0.2)$ by using Runge-Kutta method of fourth order.

[5316]-104   2

(*ii*)   (*a*)   Apply Hermite interpolation formula to obtain polynomial of degree three from the following data :

X :   0   1

Y :   0   1

Y':   0   1

(*b*)   Given that $Y' = X + Y$ with $Y(0) = 1$. Obtain $Y(0.05)$ by Euler's modified method.

Total No. of Questions—4]   [Total No. of Printed Pages—2

Seat
No.

[5316]-105

S.Y. B.Sc. (Computer Science) (Sem. I) EXAMINATION, 2018

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.

(iv) Use of calculator is allowed.

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

(a)   How many caches are there in Pentium microprocessor ?

(b)   What is RISC architecture ?

(c)   Explain the function of address bus and data bus of a processor.

(d)   State various modes of data transfer.

(e)   Convert $(11010)_2$ to gray code.

(f)   Why is DMA data transfer faster ?

(g)   Define Excitation table.

(h)   Calculate number of address lines required for 1 K × 8 memory chip.

(i)   What is virtual memory ?

(j)   Draw *two* level memory hierarchy.

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

(*a*) Define hit ratio. If cache memory access time is 100 ns and main memory access time is 500 ns, what is the average access time if number of miss are 10 out of 100 references.

(*b*) Explain DMA data transfer with the help of neat diagram.

(*c*) Differentiate between Hanard and Von Neumann architecture.

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

(*a*) Draw neat diagram of Decimal to BCD convertor. Explain it in brief.

(*b*) Explain stack organization with the help of neat diagram.

(*c*) How many chips are required to build a memory of 256×16 using 256×4 memory chip. Calculate number of address lines required for 256×16 memory chip. Show how it can be constructed with the help of neat diagram.

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

(A) (*a*) Differentiate between asynchronous and synchronous serial data transfer.

(*b*) Draw block diagram of associative memory. Explain it in detail.

Or

(B) (*a*) Design full adder using K-map. Draw its neat diagram.

(*b*) Draw neat diagram of Execution unit of 8086 micropro-cessor. Explain function of stack pointer, ALU and flags.

Total No. of Questions—4]   [Total No. of Printed Pages—3

Seat
No.

[5316]-106

S.Y. B.Sc. (Computer Sc.) (I Sem.) EXAMINATION, 2018

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.

(*iv*) Use of calculator is allowed.

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

(*a*)   What do you mean by PIR sensor ?

(*b*)   What do you mean by active sensor ?

(*c*)   How many comparators are required for 3-bit flash ADC ?
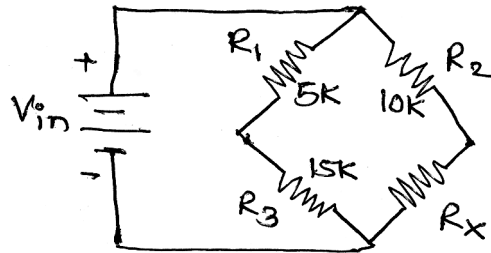
(*d*)   Find output voltage of LM-35 at 70°C.

(*e*)   Find cut-off frequency of low pass filter if R = 1 kΩ and
        C = 0.1 µF.

(*f*)   Give any *two* applications of tilt sensor.

(*g*)   Write any *two* salient features of instrumentation amplifier.

(*h*)   Define accuracy w.r.t. ADC.

(*i*)   Write any *two* advantages of R-2R Ladder DAC.

(*j*)   Find unknown resistance R_x, in balanced condition for the following figure :

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

(*a*)   A 4-bit R-2R ladder network with 0 = 0V and 1 = 10 V. Find :

   (*i*)   Full scale output voltage

   (*ii*)   Analog output for digital input 1001

   (*iii*) Analog output due to LSB change.

(*b*)   Explain operating principle of LVDT with neat diagram.

(*c*)   Differentiate between active and passive filters.

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

(*a*)   Draw circuit diagram of voltage to frequency converter and explain its operation.

(*b*)   Explain with diagram the case study of ECG.

(*c*)   Explain the working principle of capacitive touch sensor and state any *two* applications of it.

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

(A) (*i*) Explain with neat diagram, principle of operation of pH sensor.

(*ii*) Explain the working of successive approximation ADC with neat diagram.

Or

(B) (*i*) Explain with neat diagram water level indicator system using float switch.

(*ii*) Draw the circuit diagram of instrumentation amplifier using 3 op-amp. Derive an expression for output voltage.

Total No. of Questions—4]   [Total No. of Printed Pages—4

Seat
No.   **[5316]-107**

S.Y. B.Sc. (Computer Science) (Sem. I) EXAMINATION, 2018

ENGLISH

(EN-211—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*)   Why is Saturn said to be a world in the making ?

(*ii*)   Why is Mars called a dying world ?

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

(*i*)   What according to J.B.S. Haldane are the dangers of neglecting the developments and application of science ?

(*ii*)   How has development of science in the field of medicine helped civilisation ?

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

(*i*)   What is Jerzy Kosinsky's attitude towards Television ?

(*ii*)   Do you agree that the poem "Purdah(I)" is about every woman ? Give reasons for your answer.

P.T.O.

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

   (*i*) 'A Psalm of Life' reads like a prayer of hope, joy and optimism. Elaborate.

   (*ii*) What according to the writer are the consequences of growing up with a television ?

3. (A) Fill in the blanks with appropriate words from the bracket : [5]

   (*i*) I .... if I can leave early today.

       (suspect, doubt)

   (*ii*) Nothing can .... the fact that she is my best friend.

       (alter, altar)

   (*iii*) The director's decision to resign was .... for the institute.

       (momentary, momentous)

   (*iv*) The bus .... was affordable.

       (fair, fare)

   (*v*) A beautiful temple was built .... the river.

       (besides, beside)

(B)	Match the words that mean the same :	[5]

	A		**B**
(*i*)	abate		destroy
(*ii*)	yearly		useless
(*iii*)	futile		lessen
(*iv*)	mandatory		annually
(*v*)	wreck		compulsory

4.	(A)	Fill in the blanks with appropriate tense form of verbs in the bracket :	[5]

(*i*)	Kalidas .... (be) a great poet.

(Simple past)

(*ii*)	The bus .... (leave) when we reached the bus stop.

(Past perfect)

(*iii*)	I .... (speak) to some students.

(Future progressive)

(*iv*)	He .... (write) poems.

(Simple present)

(*v*)	She .... (train) the students for the parade.

(Present progressive)

(B)	Do as directed :	[5]

(*i*)	My sister, who is talented paints beautifully.

(Change into a simple sentence)

(*ii*) If you have a healthy diet, you will be able to fight infections.

(Change into compound)

(*iii*) Shefali exercises daily.

(Change into interrogative)

(*iv*) The dogs have not been fed today.

(Change into active voice)

(*v*) Could you water the plants, please ?

(Change into an imperative sentence)

Total No. of Questions—5] [Total No. of Printed Pages—5

Seat
No.

[5316]-2

F.Y. B.Sc. (Computer Science) EXAMINATION, 2018
COMPUTER SCIENCE
Paper-II
CS-102 : File Organization and Fundamentals of Databases)
(2013 PATTERN)

Time : Three Hours Maximum Marks : 80

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

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

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

(*iv*) Assume suitable data if necessary.

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

(*a*) Define attributes with example.

(*b*) What is Cartesian product operation in relational algebra ?

(*c*) What is functional dependency ?

(*d*) Give syntax and example of select operator.

(*e*) Define BCNF.

(*f*) State any *two* types of indices.

(*g*) List any *two* advantages of DBMS.

(*h*) Modification in table is a part of DDL statement. Justify true or false.

(*i*) State different types of users of DBMS.

(*j*) What is referential integrity ?

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

(*a*) Write a short note on data independence.

(*b*) Define entity set. Explain strong and weak entity.

(*c*) Explain B+ tree file organization.

(*d*) Compare primary key, candidate key and super key.

(*e*) Explain any *two* relational algebra operations with suitable examples.

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

(*a*) What is a foreign key constraint ? Why are such constraints important ? What is referential integrity ?

(*b*) Let R = (A, B, C, D, E) is a relational schema with the following functional dependencies :

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

List the candidate keys for R.

(*c*) Explain Armstrong axioms any *five.*

(*d*) What is existance dependency of entity set ? Explain it with suitable example.

(*e*) Give a set of functional dependencies for the relation at schema R (A, B, C, D) with primary key AB under which R is in 1NF but not in 2NF.

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

(*a*) Consider the following relations :

Supplier (sid, sname, address)

Parts (pid, pname, color, cost)

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

(*i*) List all the suppliers who is supplying some red parts.

(*ii*) Find the number of parts supplied by each supplier.

(*iii*) Find the supplier names of parts whose cost is more than Rs. 250/-

(*b*) Consider the following relations :

Branch (bno, bname, street, area, city, pincode, officeno);

Staff (sno, frame, iname, address, position, salary)

Branch and staff are related with one to many relationship.

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

(*i*) List the staff who works in the branch at "Tilak Road".

(*ii*) Find staff whose salary is larger than the salary of all staff members at branch "S1".

(*iii*) Give names of all branch managers in Kolhapur.

(*c*) Consider the following relations :

Country (contrycode, name, capital)

Population (pcode, pcount)

Country and population are related with one to one relationship.

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

(*i*) Find the country name having lowest population.

(*ii*) Find the name and population of a country whose capital name starting with a.

(*iii*) List the names of all countries whose population is within the range 1,00,000 to 4,00,000.

(*d*) Consider the following relations :

Person (pno, name, address)

Car (cno, year, model)

Person and car are related with one to many relationship.

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

(*i*) List all the names of people from Kharadi and have Maruti 800

(*ii*) Change address of Mr. Korth to Pune.

(*iii*) List the name of people having car before 2010.

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

(*a*) Consider the following relations :

Player (<u>pno</u>, pname, city)

Game (<u>gno</u>, gname, city)

Player-Game (<u>pno</u>, <u>gno</u>, date)

(*i*) Find all players playing "Football".

(*ii*) List all games details played on 28/3/2018

(*iii*) List all games details played in Jaipur.

(*iv*) List all players playing both football and basketball.

(*v*) List all players who are playing in the same city where they live.

(*b*) Consider the following relations :

Item (<u>icode</u>, name, price);

Order (<u>ocode</u>, cust-name, date)

Item-order (<u>icode</u>, <u>ocode</u>, quantity)

Solve the following queries in relational algebra :

(*i*) Find all items that are oredered by Amit Kumar.

(*ii*) Find order details of each item.

(*iii*) List all items ordered between 25 January 2018 to 28 January 2018

(*iv*) Find item names with lowest cost.

(*v*) List all the items with their price having ordered quantity more than 100.

5. (A) Savitribai Phule Pune University offers choice based credit system to all P.G. Course. For P.G. science courses students have to complete 100 credits to get their certificate. These courses have semesters two, three .... Each semester has set of subjects. The subject may be core (compulsory) or elective (optional).
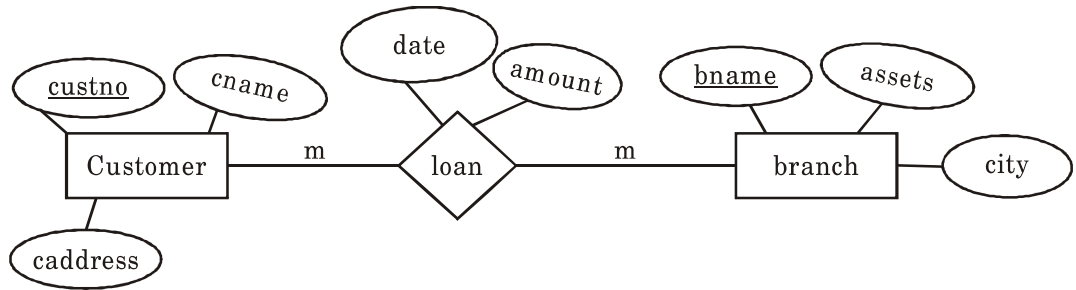
(*i*) Design an E-R diagram for above scenario, assume, attributes if necessary.

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

(B) What is DDL ? Write any *two* examples of DDL. [3]

Or

Consider the following E-R diagram :

Convert the above E-R diagram into relational model. [3]

Total No. of Questions—4]　　　　[Total No. of Printed Pages—3

Seat
No.

[5316]-201

S.Y. B.Sc. (Sem. II) EXAMINATION, 2018

COMPUTER SCIENCE

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

(2013 PATTERN)

Time : Two Hours　　　　　　　　　　Maximum Marks : 40

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

　　　　(*ii*)　*All* questions carry equal marks.

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

　　　　(*iv*)　Assume suitable data, if necessary.

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

　(*a*)　Define object.

　(*b*)　How can a comment be written in a C++ ?

　(*c*)　What is data abstraction ?

　(*d*)　What is copy constructor ?

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

　(*f*)　Define manipulators.

　(*g*)　List the file mode operations in C++.

　(*h*)　List the types of template.

　(*i*)　How is an exception rethrown ?

　(*j*)　"A pure virtual function in a class will make the class abstract"—
　　　　State True/False.

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

(*a*) Write a C++ program to design a base class person (name, address, phoneno). Derived a class employee (eno, ename) from person. Derived a class principal (degree, specialisation, salary) from employee. Write a menu to :

(*i*) accept all details of 'n' principals

(*ii*) display principal getting higher salary.

(*b*) Write a C++ program to display the contents of a text file in reverse order. (Use pointer manipulation).

(*c*) Write a C++ program which accepts student information (name, age and year) The program should throw an exception for the following situations

— age is not between 10 and 18.

— year is not "FY", "SY" and "TY".

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

(*a*) Differentiate between C++ and C.

(*b*) What is the purpose of virtual function ? State the rules for virtual function.

(*c*) What is function template ? Explain overloading of template function.

4. Attempt either A or B : [10]

    (A) (*a*) What is friend function ? What are the features of friend function ? [4]

          (*b*) Define the following terms : [3]

               (*i*) Namespace

               (*ii*) Exception

               (*iii*) Virtual Base Class.

          (*c*) What is the use of seekg( ) & seekp( ). [3]

    (B) (*a*) Write a short note on constructors. [4]

          (*b*) Write and explain block structure of C++ program. [3]

          (*c*) What is the use of tellg( ) and tellp( ) ? [3]

Total No. of Questions—4] [Total No. of Printed Pages—2

Seat
No.

[5316]-202

S.Y. B.Sc. (Sem. II) EXAMINATION, 2018

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*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

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

(*a*) List the objective of structured analysis.

(*b*) List any *two* key XP activities.

(*c*) List the benefits of transaction processing system.

(*d*) What do you mean by system development life cycle ?

(*e*) List the benefits of prototyping model.

(*f*) List any *two* advantages of DFA.

(*g*) Write the purpose of testing.

(*h*) List the primary goal of Software Engineering.

(*i*) Define IEEE definition of requirement.

(*j*) List the goal of Requirement Engineering.

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

(*a*) Explain elicitation in detail.

(*b*) Explain preliminary investigation of SDLC.

(*c*) Explain elements of system in detail with suitable diagram.

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

(*a*) Explain any *five* core principles in Software Engineering.

(*b*) Explain spiral model in detail.

(*c*) Explain components of Data Dictionary.

4. Attempt the following : [2×5=10]

(*a*) Explain any *five* principles to achieve agaility.

Or

Define fact finding. Explain interview fact finding technique in detail.

(*b*) Draw context level DFD and first level DFD for Library Management System.

Total No. of Questions—4]   [Total No. of Printed Pages—4

Seat
No.

[5316]-203

S.Y. B.Sc. (Computer Science) (Sem.-II) EXAMINATION, 2018

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. Attmpet any *five* of the following :   [10]

(*i*) If the transformation matrix [T] = $\begin{bmatrix} 2 & -3 \\ 2 & -1 \end{bmatrix}$ is applied to a circle of radius 2 units then find the area of resulting figure.

(*ii*) Determine if the transformation of reflection through *y*-axis is a solid-body transformation. Justify your answer.

(*iii*) What is the effect of the transformation matrix [T] = $\begin{bmatrix} \dfrac{1}{2} & \dfrac{\sqrt{3}}{2} \\ -\dfrac{\sqrt{3}}{2} & \dfrac{1}{2} \end{bmatrix}$

on a two-dimensional object ?

(*iv*) Determine the foreshortening factors f_x and f_y if the transformation matrix for axonometric projection is

$$[T] = \begin{bmatrix} 0.5 & 0.43 & 0 & 0 \\ 0 & 0.86 & 0 & 0 \\ 0.86 & 0.25 & 0 & 0 \\ 3.58 & 0.75 & 0 & 1 \end{bmatrix}$$

(*v*) Obtain the transformation matrix for a cavalier projection for $\alpha = 45°$.

(*vi*) State any *two* properties of Bezier curve.

(*vii*) Find the value of δ_θ to generate uniformly spaced 5 points on the hyperbolic segment in the first quadrant for $6 \le X \le 12$; where the equation of hyperbola is $\dfrac{x^2}{9} - \dfrac{y^2}{4} = 1$.

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

(*i*) If the 2 × 2 transformation matrix transforms the points P and Q to the points P* and Q* respectively, then prove that the same transformation transforms the mid-point of line segment PQ to the mid-point of line segment P*Q*.

(*ii*) Find the concatenated transformation matrix and apply it on a triangle with vertices O[0, 0], A[1, 2], B[3, −1]. The sequence of transformations is given below :

(*a*) Rotation about origin through angle 50º

(*b*) Shearing in *y*-direction by −2.1 units.

(*c*) Uniform scaling by factor 2.

(*iii*) Determine through what angles the plane $x + y + z = 0$ be rotated about the x-axis and then about the y-axis, so that it coincides with the $z = 0$ plane.

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

(*i*) Find the trimetric projection formed by first rotation about the y-axis through an angle 75º, followed by rotation about the x-axis through an angle 20º, followed by the orthographic projection onto the $z = 0$ plane. Determine principle foreshortening factors also.

(*ii*) Derive the rotation angle 'ϕ' about the y-axis and rotation angle 'θ' about the x-axis in dimetric projection for the given principle foreshortening factor f_z along z-axis.

(*iii*) Write an algorithm for rotation through angle 'δ' about a line passing through the point (x_0, y_0, z_0) and having direction cosines (c_x, c_y, c_z).

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

(*i*) (*a*) Find the parametric equation of the Bezier curve determined by the control points $B_0(-2, -3)$, $B_1(-1, 2)$, $B_2(3, 5)$ and $B_3(6, 2)$. Find the points on the curve corresponding to the parameter values $t = 0.37$, 0.65 and 0.2.

(*b*) Obtain 4 uniformly spaced points in the first quadrant of the unit circle with centre at origin.

(*ii*) (*a*) Obtain the recurrence relation to generate 5 equally spaced points on the parabolic segment in the first quadrant for $2 \leq X \leq 8$, where the equation of the parabola is $y^2 = 8x$.

(*b*) Find the concatenated transformation matrix for first scaling in x and z co-ordinates by factors 4 and 6 respectively ; followed by single point perspective projection onto the $y = 0$ plane from centre of projection at $y_c = 20$ on the y-axis. Apply this transformation onto the point P (2, 2, –1).

Total No. of Questions—**4**] [Total No. of Printed Pages—**6**

Seat
No.

[5316]-204

S.Y. B.Sc. (Computer Science) (II Sem.) EXAMINATION, 2018

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*) Define : Slack and Surplus variables.

(*ii*) Write dual of the following linear programming problem :

Maximize : $Z = 5x_1 + 3x_2$

Subject to : $3x_1 + 2x_2 \leq 6$

$3x_1 + x_2 = 4$

$x_1, x_2 \geq 0$

(*iii*) Solve the following game by dominance principle :

Player B

$$
\begin{array}{c} \\ \text{Player A} \end{array}
\begin{array}{c} \\ \text{I} \\ \text{II} \end{array}
\begin{array}{ccc}
\text{I} & \text{II} & \text{III} \\
\left[\begin{array}{ccc} 6 & 8 & 6 \\ 4 & 12 & 12 \end{array}\right]
\end{array}
$$

(*iv*) Write in linear programming problem form of the given

transportation problem :

Destination

		D_1	D_2	Capacity
Source	F_1	2	1	5
	F_2	1	3	12
	Demand	11	6	17

(*v*) Define :

(1) Saddle point

(2) Fair game.

(*vi*) For what value of λ, the game with the following pay-off matrix

is strictly determinable :

Player B

$$
\begin{array}{c} \\ \\ \text{Player A} \end{array}
\begin{array}{c} \\ \text{A}_1 \\ \text{A}_2 \\ \text{A}_3 \end{array}
\begin{array}{ccc}
\text{B}_1 & \text{B}_2 & \text{B}_3 \\
\left[\begin{array}{ccc} \lambda & 6 & 2 \\ -1 & \lambda & -7 \\ -2 & 4 & \lambda \end{array}\right]
\end{array}
$$

(*vii*) Convert the following linear programming problem into canonical form :

Minimize : $\quad$ $Z = 2x_1 + 4x_2 + x_3$

Subject to : $\quad$ $x_1 + 2x_2 - x_3 \leq 5$

$$2x_1 - x_2 + 2x_3 \geq -2$$

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

$$x_1, \; x_2, \; x_3 \geq 0$$

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

(*i*) Solve the following linear programming problem graphically :

Maximize : $\quad$ $Z = 24x + 8y$

Subject to : $\quad$ $2x + 3y \leq 40$

$$4x + y \leq 20$$

$$10x + 8y \leq 60$$

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

(*ii*) Solve the following linear programming problem by simplex method :

Maximize : $\quad$ $Z = 5x_1 + 3x_2$

Subject to : $\quad$ $3x_1 + 5x_2 \leq 15$

$$6x_1 + 2x_2 \leq 24$$

$$x_1, \; x_2 \geq 0$$

(*iii*) Find an I.B.F.S. of the following transportation problem by VAM :

To → From ↓	W_1	W_2	W_3	W_4	Supply
F_1	30	25	40	20	100
F_2	29	26	35	40	250
F_3	31	33	37	30	150
Demand	90	160	200	50	500

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

(*i*) Write an algorithm to solve the assignment problem for optimal cost.

(*ii*) The following is I.B.F.S. of the transportation problem :

1 ⟨20⟩	2	1 ⟨10⟩	4
3	3 ⟨20⟩	2 ⟨20⟩	1 ⟨10⟩
4	2 ⟨20⟩	5	9

Show that it is optimal solution. Also find alternate optimal solution.

(*iii*) Solve the following assignment problem :

Machines

	1	2	3	4
A	5	5	—	2
B	7	4	2	3
C	9	3	5	—
D	7	2	6	7

Operators (A, B, C, D)

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

(*i*) (*a*) Solve the following game graphically :

Player B

	I	II	III
I	2	3	11
II	7	5	2

Player A (I, II)

(*b*) Solve the following assignment problem for minimum cost :

Jobs

	I	II	III	IV	V
A	3	8	2	10	3
B	8	7	2	9	7
C	6	4	2	7	5
D	8	4	2	3	5
E	9	10	6	9	10

Persons (A, B, C, D, E)

(*ii*)   Solve the following linear programming problem by Big-M method :

Minimize : $Z = 4x_1 + 2x_2 + 3x_3$

Subject to : $2x_1 + 4x_3 \geq 5$

$$2x_1 + 3x_2 + x_3 \geq 4$$

$$x_1, \; x_2, \; x_3 \geq 0$$

Total No. of Questions—**4**]　　　　　　[Total No. of Printed Pages—**3**

Seat
No.

[5316]-205

S.Y. B.Sc. (Computer Science) (Sem.-II) EXAMINATION, 2018

ELECTRONICS SCIENCE

Paper I

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

(2013 PATTERN)

Time : Two Hours　　　　　　**Maximum Marks : 40**

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

(*ii*)　Neat diagrams must be drawn wherever necessary.

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

(*iv*)　Use of calculators is allowed.

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

(*a*)　What is the step size of 8 bit ADC if V_{ref} = 4.5 volt ?

(*b*)　Write full form of IVT and ISR with respect to interrupts of 8051 microcontroller.

(*c*)　Name the addressing mode for the instruction MOV DPTR, # 3000 H.

(*d*)　Write the function of Pin $\overline{\text{PSEN}}$.

(*e*)　What is the use of bit TR_1 in TCON register ?

(*f*)　Which port of 8051 requires external pull up resistors ?

(*g*)　What is the status of bit $P_{1.1}$ after execution of instruction SET B $P_{1.1}$?

(*h*)　Which pin of LCD is used to control the contrast ?

P.T.O.

(*i*)   What is the value of stack pointer after power on reset in 8051 microcontroller.

(*j*)   Write any *two* features of ARM microcontroller.

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

(*a*)   Draw a neat diagram of interfacing 8-bit ADC (analog to digital converter) to 8051 microcontroller and write 'C' program to run this interface.

(*b*)   Write 8051, C program to generate square wave on $P_{1.5}$ having 1000 Hz frequency and 50% duty cycle. Assume crystal frequency of 12 MHz and given a value to be loaded into timer register is $(FEOC)_{HEX}$. Use timer 1 in mode 1.

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

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

(*a*)   What will be the output of each of the following ofter execution ?

(*i*) P_1 = O × FO & O × 35

(*ii*) P_1 = O × FF ∧ O × 65

(*iii*) P_2 = ~O × IF

(*iv*) P_2 = O × 36 | O × 65

(*v*) P_1 = O × 12 >> 2

(*b*) Write any *five* differences between microcontroller and microprocessor.

(*c*) Draw a bit format of Tmod register and explain function of each bit.

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

(A) (*a*) Draw a neat diagram of interfacing stepper motor to 8051 microcontroller and write C program to run the motor.

(*b*) Explain function of the following instructions :

(*i*) MOV A, 40 H

(*ii*) AIMP addr 11

(*iii*) CPLA

(*iv*) INC R1

(*v*) MUL AB

Or

(B) (*a*) Explain the sequence of actions carried out by 8051 microcontroller when an interrupt occurs.

(b) Explain how LED can be interfaced to 8051 with a neat diagram and write a program to toggle LED connected to $P_{1.3}$ continuously.

Total No. of Questions—4]　　　　　　　[Total No. of Printed Pages—2

Seat
No.

[5316]-206

S.Y. B.Sc. (Computer Science) (Sem. II) EXAMINATION, 2018
ELECTRONIC SCIENCE
Paper II
(ELC-222 : Communication Principles)
(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 calculator is allowed.

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

(*a*)　Draw the wave form of ASK for data 101010.

(*b*)　State any *two* features of FDMA.

(*c*)　What do you mean by broadband communication ?

(*d*)　If the modulating signal amplitude is 3 volt and carrier signal amplitude is 4 volt, calculate the modulation index for AM.

(*e*)　What is advantage of spread spectrum technique ?

(*f*)　State the expression for Shannon's Theorem for Channel Capacity.

(*g*)　Write the full form of GSM.

(*h*)　What is "Hand Off" with respect to mobile communication ?

(*i*)   Define baud rate with respect to communication system.

(*j*)   A receiver has an input signal power of 1.0 mW. The noise power is 0.35 mW. Calculate the signal to noise ratio.

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

(*a*)   Explain FDM transmitter with neat block diagram.

(*b*)   How can communication systems be classified according to mode of transmission ? Explain in detail with diagrams and example.

(*c*)   Explain working of diode demodulator with neat circuit diagram and waveform.

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

(*a*)   Write any *five* features of CDMA.

(*b*)   Explain the working principle of an antenna with neat suitable diagrams.

(*c*)   Draw block diagram of delta modulator and explain its working.

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

(A)   (*i*)   Construct Hamming code for data information 0110 with even parity.

(*ii*)   Explain the working principle of FHSS.

Or

(B)   (*i*)   Differentiate between AM and FM with respect to any *five* points.

(*ii*)   Explain the components of RFID system.

Total No. of Questions—4]   [Total No. of Printed Pages—3

S.Y. B.Sc. (Computer Science) (Sem. II) EXAMINATION, 2018

ENGLISH

(EN-221 — 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 'humour' in Stephen Leacock's 'With
the Photographer'.

(*ii*)   Describe the interaction between Rosemary and the poor
girl when they met outside the shop.

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

(*i*)   Describe the changes that the photographer would like
to make with the narrator's face.

(*ii*)   What was the intention of Rosemary to help the poor
girl ?

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

  (*i*) Explain the central theme of the poem Ozymandias by P.B. Shelley.

  (*ii*) Describe the virtues mentioned in the poem 'If' by Rudyard Kipling.

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

  (*i*) How does Wordsworth describe scenic beauty in the poem Daffodils ?

  (*ii*) Explain the significance of the final line of the poem, 'If' 'And—which is more—you'll be a Man, My Son!

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

 (*i*) Write down *five* questions along with the responses that could be asked in an interview for the post of Bank Manager.

 (*ii*) Rupesh, Maya, Anil and Ramesh are given the topic 'Global Warming' for a group discussion. Write the transcript of the discussion in the dialogue form.

 (*iii*) Think of an electronic item you want to promote in the market, prepare a presentation consisting of five slides.

 (*iv*) Write a short note in five points on visual aids used in presentation.

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

    (*i*)   Write a paragraph of five or six sentences on 'Solar Energy'.

    (*ii*)   Write an essay on the impact of social media on younger generations.

    (*iii*)   Write a review of a new mobile phone available in the market.

    (*iv*)   Write a newspaper report on Annual Prize Distribution Ceremony of your college.

Total No. of Questions—5]   [Total No. of Printed Pages—7

Seat
No.   **[5316]-3**

F.Y. B.Sc. (Computer Science) EXAMINATION, 2018

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*) Write contrapositive and the converse of the following statement :

"If it is raining then the home team wins".

(*ii*) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$.

(*iii*) List a path between u_2 and u_5 of length 5 :
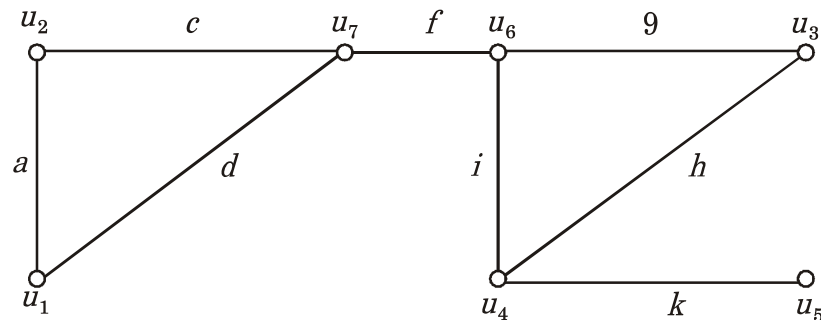
(*iv*)   Define : Self-complementary graph. Give *one* example.

(*v*)   Show that if 7 colours are used to paint 50 cars, at least 8 cars will have the same colour.

(*vi*)   Is the following Hasse diagram a lattice ? Justify :
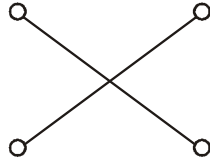
(*vii*) Prove that $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$.

(*viii*) Define simple digraph and symmetric digraph. Give *one* example each.

(*ix*)   Prove that the number of vertices n in a binary tree is always odd.

(*x*)   Find an isthmus and cut vertex of a graph :
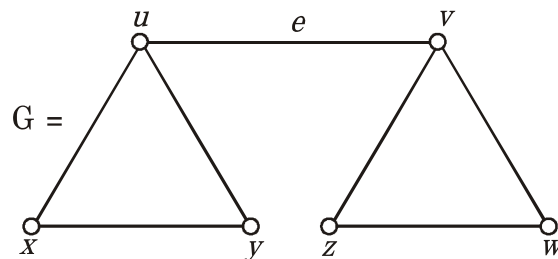
2.   Attempt any *four* of the following :   [16]

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

(1) $\overline{a \vee b} = \overline{a} \wedge \overline{b}$

(2) $a \vee (a \wedge b) = a$.

(*ii*)   Test the validity of the following argument :

R → C, S → ~ W, R ∨ S, W ⊢ C.

(*iii*) How many integers between 1 and 200 are divisible by 7 or 11 ?

(*iv*) Is the following lattice distributive ? Justify :
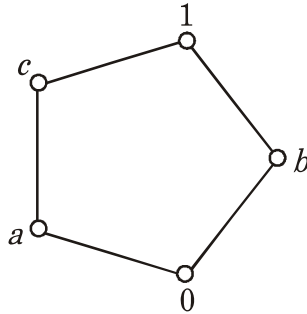
(*v*) Define :

(1) Universal quantifier

(2) Existential quantifier.

Let $\phi(x, y)$ denote "$x + y = 0$" and U = **R**. Write truth values of the following with justification :

(1) $\exists \, y \forall \, x \phi(x, y)$

(2) $\forall \, x \exists y \phi(x, y)$.

(*vi*) Give an indirect proof of "If $3n + 2$ is odd, then n is odd."

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

(*i*) Solve the recurrence relation :

$a_n - 7 a_{n-1} + 10 an_{-2} = 3^r$,

given that $a_0 = 0$, $a_1 = 1$.

(*ii*) (1) In how many ways can the letters in the following word can be arranged ?
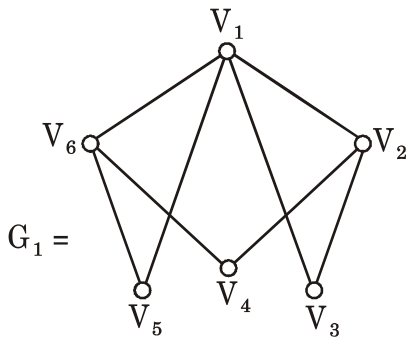
"COMPUTER"

(2) How many numbers are there between 100 and 1000 in which all the digits are distinct ?

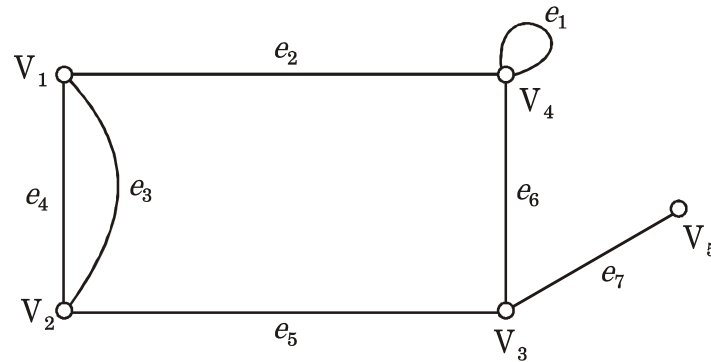(*iii*) Simplify the following Boolean function and find disjunctive normal form of the function :

$$f(x,\ y,\ z) = (x \vee y) \vee \left[\overline{(\overline{x} \vee y \vee z)} \right].$$

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

(*i*) Show that the following graphs are isomorphic :

$G_1 =$ $G_2 =$
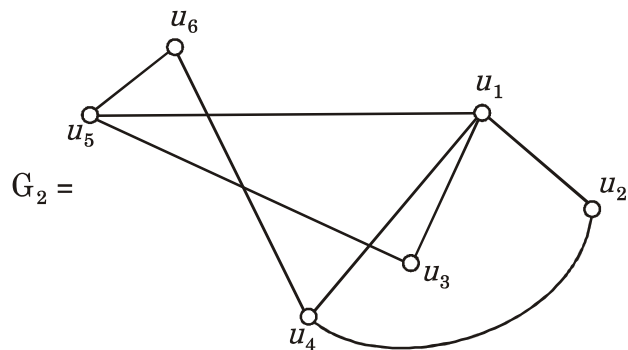
(*ii*)   Find adjacency matrix and incidence matrix of the following graph :


(*iii*) Prove that every tree has *one* or *two* centres.

(*iv*) Explain Fleury's algorithm to find Euler tour in a Eulerian graph. Illustrate with an example.

(*v*) Draw the arborescence for the following expression and write it in Polish notation :
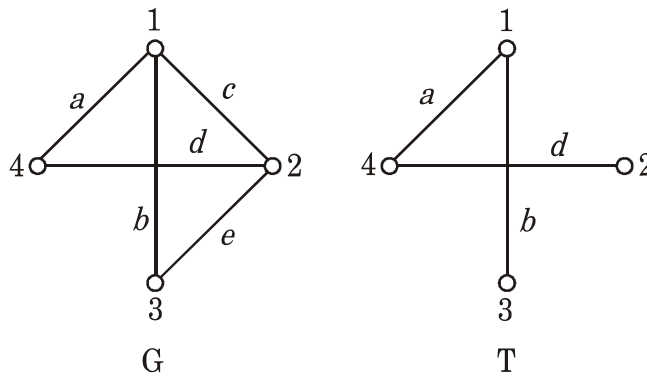
$$(5x + 8) (7y^3 - 2)^7.$$

(*vi*) Define the following terms :

(1) Network

(2) Flow

(3) Value of flow

(4) Saturated edge.
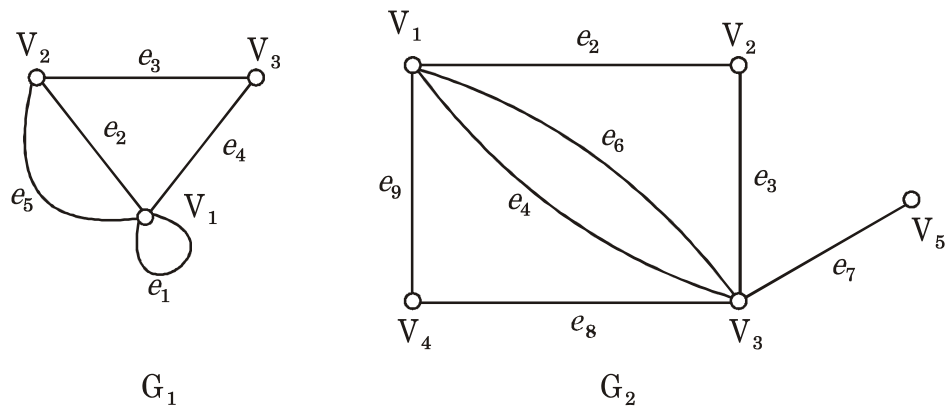
5. Attempt any *two* of the following : [16]

(*i*) Using Dijkstra's algorithm, find the shortest $s - t$ path in graph G :
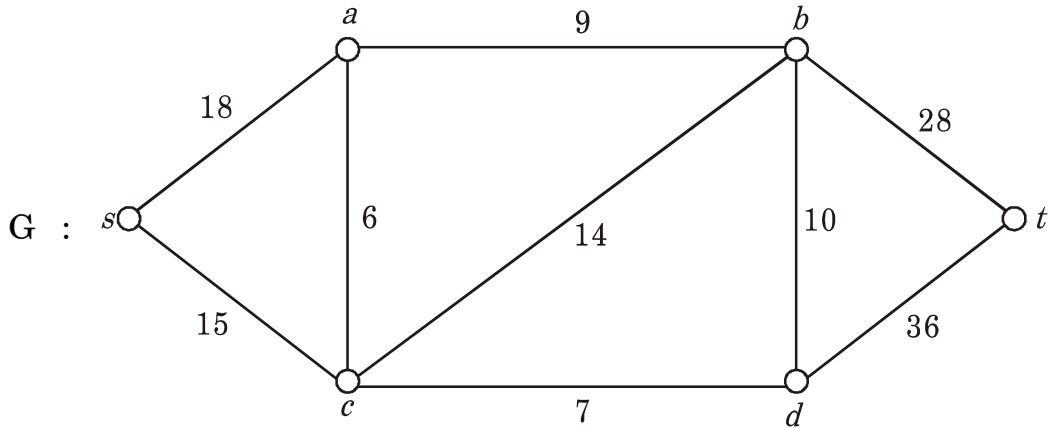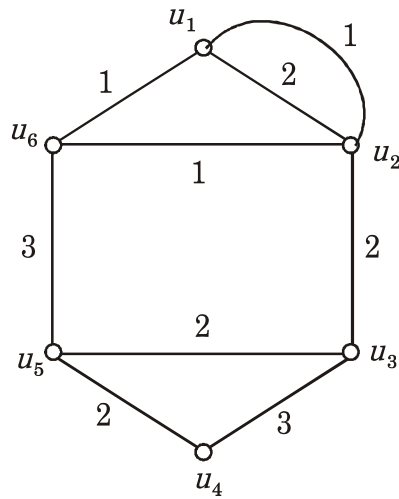

(*ii*) Consider the graph G and its spanning tree T. Find all fundamental circuits and cut sets of G with respect to T.

(*iii*) (*a*) Find $G_1 \cup G_2$ and $G_1 \cap G_2$ of the following graphs G_1 and G_2 :

(*b*) Using Kruskal's algorithm find minimum spanning tree for the following weighted graph G :

Total No. of Questions—4] [Total No. of Printed Pages—4

Seat
No.

[5316]-301

T.Y. B.Sc. (Sem. III) EXAMINATION, 2018

COMPUTER SCIENCE

Paper I

(CS-331 : System Programming)

(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*) Neat diagrams must be drawn wherever necessary.

1. Attempt *all* : [10×1=10]

   (*a*) Write any *four* elements of programming environment.

   (*b*) What is the need of editor ?

   (*c*) What are the different types of assembly language statements ?

   (*d*) What is impure interpreter ?

   (*e*) What is a dead code ?

   (*f*) Write the purpose of intermediate code.

   (*g*) List any *two* computer system architecture.

P.T.O.

(*h*) What is the purpose of LTORG ?

(*i*) Define macro assembler.

(*j*) What is a system call ? List any *two* system calls.

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

(*a*) Define debugging and state the functions of debugging.

(*b*) Write a note on relocatable program and self relocatable program.

(*c*) Consider the following assembly language program :

            START 100

            READ N

        LOOP MOVER   AREG,N

            SUB   AREG,='I'

            BC   GT,LOOP

            STOP

        A   DS   I

            END

Instruction opcode	Assembly mnemonic
00	STOP
01	READ
02	MOVER
03	SUB
04	BC

Declarative semt
DS   01

Assembler directive
START 01
END 02

Write intermediate code form using variant-I and variant-II.

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

(*a*) What are the different factors affecting pass structure of an assembler.

(*b*) Write a brief note on Distributed Operating System and Real time embedded operating system.

(*c*) Consider the following macro :

```
        MACRO
        COMPUTE   &A, &B, &REG = AREG
        LCL       &C
&C      SET       10
        MOVER     &REG, &A
        ADD       &REG, &C
LOOP    MOVEM     &REG, &A
&C      SET       &C-1
        AIF       (&A NE &B).LOOP
        MEND
```

Show the contents of the following data structure :

(*i*) MNT

(*ii*) MDT

(*iii*) PNTAB

(*iv*) KPDTAB

(*v*) EVNTAB.

4. Attempt either (A) *or* (B) :

    (A)   (*a*)   What is a forward reference and what is the solution to solve the forward reference problem ? [4]

           (*b*)   Explain in detail the conditional and unconditional statements in macro. [4]

           (*c*)   Explain word processor as an editor. [2]

Or

    (B)   (*a*)   Explain peer-to-peer computing. [4]

           (*b*)   Differentiate between compiler and interpreter. [4]

           (*c*)   State any *four* operating system services. [2]

Total No. of Questions—4]   [Total No. of Printed Pages—4

Seat
No.

[5316]-302

T.Y. B.Sc. (III Sem.) EXAMINATION, 2018
COMPUTER SCIENCE
Paper II
CS-332 : Theoretical Computer Science
(2013 PATTERN)

Time : Two Hours   Maximum Marks : 40

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) *All* questions carry equal marks.

(*iii*) *All* questions are compulsory.

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

(*a*) What are the proper prefix and proper suffix of the string "India" ?

(*b*) Define DFA.

(*c*) Write down the $\in$-closure of each state from the following FA :

(*d*) Write smallest possible string accepted by the following regular expression :

$$(01 + 10^*)^* \ 1.$$

P.T.O.

(*e*)   Every recursive language is recursively enumerable. (True or False) justify.

(*f*)   Write formal definition of DPDA ?

(*g*)   Define unit production with example.

(*h*)   Define right linear grammar.

(*i*)   State *two* differences between PDA and FA.

(*j*)   State lemma 1 for converting a CFG to GNF.

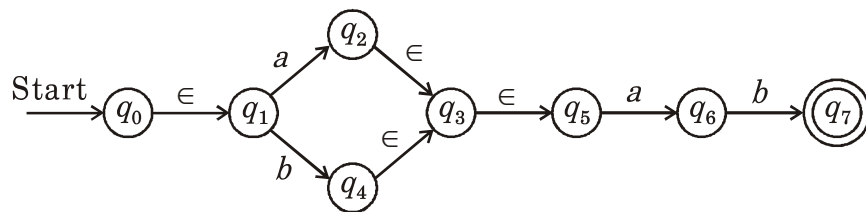**2.**   Attempt any *two* of the following :   [2×5=10]

(*a*)   Construct DFA containing all string starting with 01 and having

012 as substring.   [5]

(*b*)   Construct FA for regular expression :   [5]

$$(01)* + (0 + 1)*\ 0*\ 1.$$

(*c*)   Convert the following NFA with $\in$ moves to DFA :   [5]

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

(*a*) Construct a PDA for L = $\{a^n b^{2n} c^k | n \geq 1, k \geq 1\}$. [5]

(*b*) Construct the following CFG into Chomsky Normal Form (CNF) : [5]
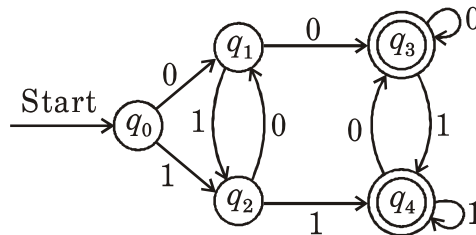
S → aSa|bSb|a|b|aa|bb

(*c*) Construct CFG for the following :

(*i*) L = $\{a^n b^{n+2} | n > = 0\}$

(*ii*) A language containing string having at least one occurrence of 11 over {0, 1}. [5]

4. Attempt (A) *or* (B) : [1×10=10]

(A) (*a*) Construct minimal DFA for the following : [4]

(*b*) Design a TM to recognize well-formedness of parenthesis( ). [4]

(*c*) Define the following terms : [2]

(*i*) kleen closure

(*ii*) parse tree.

Or

(B) (*a*) Construct Mealy machine to convert each occurrence of substring 101 by 100 over alphabet {0, 1}. [4]

(*b*) Construct PDA that accept langauge as S → aS|aSbS|a. [4]

(*c*) Show that CFL's are closed under union. [2]

Total No. of Questions—4]　　　　　[Total No. of Printed Pages—2

[5316]-303

T.Y.B.Sc. (Sem. III) EXAMINATION, 2018

COMPUTER SCIENCE

Special 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 questions :　　　　　[10×1=10]

(*a*)　Write any *two* advantages of Star topology.

(*b*)　What is the responsibility of Physical Layer ?

(*c*)　List the cables used with Ethernet LAN.

(*d*)　Define Multiplexing and Demultiplexing.

(*e*)　Draw the frame format of PPP.

(*f*)　List the *three* types of MAC protocol.

(*g*)　State the difference between serial and parallel transmission.

(*h*)　What is Piggybacking ?

(*i*)　A telephone network is an example of a circuit switched network. State True/False.

(*j*)　Give the diagrammatic representation of Mesh Topology.

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

(*a*) What is Topology ? Explain the Ring Topology with advantages and disadvantages.

(*b*) Write a short note on Microwave 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.

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

(*a*) Compare and contrast OSI and TCP/IP model.

(*b*) Explain serial transmission in detail.

(*c*) Given a 12-bit sequence 110111100101 and a divisor of 1001. Find the CRC.

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

(A) (*a*) Explain the characteristics of Line coding.   [4]

   (*b*) Explain the strategies used by CSMA/CA.   [4]

   (*c*) What is Framing ? List methods of framing.   [2]

                                   Or

(B) (*a*) Compare the circuit and packet switching.   [4]

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

   (*c*) List any *four* goals of Computer Network.   [2]

Total No. of Questions—4]   [Total No. of Printed Pages—3

Seat
No.

[5316]-304

T.Y.B.Sc. (Sem. III) EXAMINATION, 2018
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 :   [10×1=10]

(*a*) How do you define constant PI with value 3.142 in PHP ?

(*b*) What is type casting ?

(*c*) How to create object in PHP ?

(*d*) What will be output of the following :

```
<?php
    $a = "LK9";
    $a++;
    Echo $a;
?>
```

(*e*) What is the difference between echo( ) and print( ) functions ?

(*f*) What is the difference between single and double quoted string ?

(*g*) What is serialization ?

(*h*) What is PEAR DB Library ?

(*i*) State the purpose of Array_filter ( )function.

(*j*) List any *four* web browser names.

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

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

(*b*) What is array ? Explain different types of Array with an example.

(*c*) Explain constructor and destructor with suitable example.

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

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

(*i*)   Func_get_arg( )

(*ii*) Var_dump( )

(*iii*) Strrev( )

(*iv*) Similar_text( )

(*v*)   Str_replace( )

(*b*) List and explain (any *three*)the functions of PCRE.

(*c*) Write a PHP script to accept filename from the user and print total number of words.

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

(A) (*a*) Explain the following functions with respect to Array :

(*i*)   Explode( )

(*ii*) Array_unshift( )

(*iii*) Array_slice( )

(*iv*) Krsort( )   [4]

(*b*) Write a php script display the student details in table format. [4]

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

Or

(B) (*a*) Explain the following function with example : [4]

(*i*) Fputs( )

(*ii*) Fseek( )

(*iii*) readFile( )

(*iv*) Filemtime( )

(*b*) Write a PHP script to accept and insert records in employee table. [4]

(*c*) Write a short note on Interface. [2]

Total No. of Questions—4]   [Total No. of Printed Pages—2

Seat
No.

[5316]-305

T.Y. B.Sc. (Third Semester) EXAMINATION, 2018
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 do you mean by jdb ?

(*b*)   List any *two* methods of object class.

(*c*)   When we declare a method or class final ?

(*d*)   How print() is differ from print() method ?

(*e*)   Define unchecked exception.

(*f*)   What is meant by Garbage collection ?

(*g*)   Explain the use of repaint ( ).

(*h*)   Write a syntax of JFileChooser class.

(*i*)   Which method is used to compare values of 2 string objects ?

(*j*)   Why swing objects are called as light weight components ?

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

(*a*) Differentiate between Java & C++.

(*b*) How do we design, create and access a package in java ? Discuss with suitable example.

(*c*) Write a program in java to create a screen which contains three checkboxes (.net, php, java) and displays the selected items in a textbox.

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

(*a*) What is runtime polymorphism ? How is it implemented in java ? Give suitable example.

(*b*) Write a java program which display the contents of file in reverse order.

(*c*) Write a java program to find second smallest element in an array.

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

(A) (*a*) What are user-defined exceptions ? Illustrate them with an example. [5]

(*b*) What is difference between string and string buffer class. [3]

(*c*) Explain the use of this keyword in java. [2]

Or

(B) (*a*) Create an applet which contains three radio buttons red, green and blue and change the background color to the selected color. [5]

(*b*) Explain **2** types of Inheritance with suitable example. [3]

(*c*) What is use of layout manager ? Explain any *one* layout manager ? [2]

Total No. of Questions—4]   [Total No. of Printed Pages—3

Seat
No.

[5316]-306

T.Y. B.Sc. (Sem. III) EXAMINATION, 2018

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*)   *All* questions carry equal marks.

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

(*iv*)   Neat diagrams must be drawn wherever necessary.

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

(*a*)   "Due to inheritance modifications/maintenance of system become difficult." State True/False and Justify.

(*b*)   Give any *two* applications where UML can be used.

(*c*)   Define the object "Patient" with possible attributes and operations with visibility.

(*d*)   Define Interface.

(e)   What is purpose of use case view ?

(f)   Write any *two* phases of RUP.

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

(h)   What are components of deployment diagram ?

(i)   Define test case.

(j)   Define swim lanes.

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

(a)   What is aggregation ? Explain multilevel aggregation with suitable example.

(b)   What do you mean by an iterative development ? Give its benefits.

(c)   Discuss the components of sequence diagram.

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

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

(b)   Compare between Alpha and Beta testing.

(c)   Draw class diagram for airport system consisting of at least three classes. Define appropriate relationships, association with multiplicity.

4. Attempt the following :

(A) An automated systems is to be designed for ATM banking. A bank can have multiple customers and all of them are issued the ATM cards. Customer swap the card which is verified by ATM. Customer select the kind of a transaction. If the transaction is to withdraw amount, it verifies the limit and minimum balance required. It also prints various transaction reports, account balance statement etc.

Consider above aspects and draw the following diagrams :

(*i*) Draw use case diagram. [3]

(*ii*) Draw sequence diagram. [4]

(B) Compare between model and meta model. [3]

Or

Draw a collaboration diagram for "student admission system". [3]

Total No. of Questions—5]   [Total No. of Printed Pages—5

Seat
No.   **[5316]-4**

F.Y B.Sc. (Computer Science) EXAMINATION, 2018

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 calculator is allowed.

1.   Attempt any *eight* out of ten :   [8×2=16]

    (1)   Find matrix and digraph for the following relation R on the

        set A = {1, 2, 3} :

            R = {(1, 2), (1, 3), (3, 1), (3, 3)}.

    (2)   Define Euler's ϕ function. Find $\phi(250)$.

    (3)   Find values of the following expressions in $(\mathbf{Z}_5, +_5)$:

    (*i*) $\bar{2}^3 + \bar{4} \times \bar{3}$

    (*ii*) $\bar{2} \times \bar{4} - (\bar{3})^{-1}$.

                                                           P.T.O.

(4) State true or false with justification :

'The binary operation defined by $a * b = |a - b|$ on $\mathbf{Z}^+ \cup \{0\}$ is associative.'

(5) Let $f : \mathrm{R} \rightarrow \mathrm{R}$ be defined by $f(x) = 2x - 5$ and $g : \mathrm{R} \rightarrow \mathrm{R}$ be defined by $g(x) = \sin(x^2)$. Find $f \circ g(x)$, $g \circ f(x)$.

(6) Define elementary matrix. Find an elementary matrix E such that EA = I, where $A = \begin{bmatrix} 1 & 0 \\ -5 & 1 \end{bmatrix}$.

(7) Is the following matrix in reduced row echelon form ? Justify :

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

(8) State Maclaurin's theorem with Lagrange's form of remainder.

(9) If $y = \dfrac{1}{x^2 - x - 2}$, find y_n.

(10) Give geometrical interpretation of Rolle's mean value theorem.

2. Attempt any *four* out of six : [4×4=16]

(1) Find the remainder of 9^{153} when divided by 11.

(2) If $c | ab$ and gcd $(b, c) = 1$, then prove that $c | a$.

(3) Prove by induction that $(x^n - y^n)$ is divisible by $(x - y)$ for $n \geq 1$.

(4) Express the following permutation on S_9 as a product of disjoint cycles :

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

Also find order of σ.

(5) Let G be the set of all non-zero real numbers and let $a * b = \dfrac{ab}{2}$. Show that $(G, *)$ is an abelian group.

(6) Let A = {1, 2, 3} and R = {(1, 2), (2, 2), (2, 3), (3, 1), (3, 2)}. Find transitive closure of R using Warshall's algorithm.

3. Attempt any *two* out of three :   [2×8=16]

(1) Define greatest common divisor (g.c.d.) of two integers. Find g.c.d. of 7260 and 1638. Also express it in the form $(7260)m + (1638)n$.

(2) (*i*) Prove that every subgroup of a cyclic group is cyclic.

(*ii*) Write all subgroups of $\mathbf{Z}_{10}$. Also write their generators.

(3) Define equivalence relation and equivalence class. Define a relation R on set of integers as follows :

'$x\mathrm{R}y$ if and only if $x + y$ is even'. Prove that R is an equivalence relation. Find distinct equivalence classes for this relation.

4. Attempt any *four* out of six :   [4×4=16]

   (1)   Solve the following system by Gaussian elimination method :

$$x_1 + 2x_2 - 4x_3 + 3x_4 = 0$$

$$x_1 + 2x_2 - 2x_3 + 2x_4 = 0$$

$$2x_1 + 4x_2 - 2x_3 + 3x_4 = 0.$$

   (2)   Assuming the validity, obtain the Maclaurin series for

$e^{\sin x}$.

   (3)   Evaluate :

$$\lim_{x \to 0} \sin x^{\tan x}.$$

   (4)   Let $f : [a, b] \to \mathbf{R}$ be continuous on $[a, b]$ and derivable on (a, b) such that $f'(x) = 0$ on (a, b), then prove that f is constant on $[a, b]$.

   (5)   Let $f(x) = -2 \sin x, \quad x \le -\dfrac{\pi}{2}$

$$= \alpha \sin x + \beta, \quad -\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$$

$$= \cos x, \quad x \ge \dfrac{\pi}{2}$$

Find the value of α and β if f is continuous everywhere.

   (6)   Let $f(x) = |x|, \quad x \in \mathbf{R}$. Show that f is not differentiable at $x = 0$.

5. Attempt any *two* out of three :   [2×8=16]

   (1)   Using LU decomposition, solve the following system :

$$\begin{bmatrix} 3 & -6 & -3 \\ 2 & 0 & 6 \\ -4 & 7 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -3 \\ -22 \\ 3 \end{bmatrix}.$$

(2)   State Leibnitz's theorem. If $y = a \cos (\log x) + b \sin (\log x)$, then show that $x^2 y_2 + xy_1 + y = 0$. Hence prove that :

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

(3)   State and prove Cauchy's mean value theorem. Verify it for the functions $f(x) = x^2$ and $g(x) = x^4$ in $[a, b]$ where a and b are positive real numbers.

Total No. of Questions—4]　　　　　[Total No. of Printed Pages—4

T.Y. B.Sc. (Sem. IV) EXAMINATION, 2018

COMPUTER SCIENCE

Paper II

(CS-341 : System Programming and Operating 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.　Attempt *all* of the following :　　　　　[10×1=10]

(*a*)　Write advantages of multiprocessor system.

(*b*)　What is dispatch latency ?

(*c*)　Define Request edge and Claim edge.

(*d*)　"A race condition exists when processes are running simultaneously." True/False. Justify.

(*e*)　Write any *two* disadvantages of priority scheduling.

(*f*)　Using segmentation, find the physical address for the logical address 2,280, having segment size 285 with base address 3000.

(*g*) List any *four* file attributes.

(*h*) "Newly created directory will have two entries automatically in it." Comment.

(*i*) List various dynamic allocation memory management methods.

(*j*) Define I/O bound process.

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

(*a*) What is co-operating processes ? Explain *two* fundamental models of inter-process communication.

(*b*) Consider the following set of processes with the length of CPU burst time and arrival time in milliseconds :

Process	Arrival time	Burst time
P_1	0	8
P_2	1	4
P_3	2	9
P_4	3	5

Illustrate the execution of these processes using pre-emptive SJF (Shortest Job First) CPU scheduling algorithm. Calculate average waiting time and average turn around time. Give the contents of Gantt Chart.

(*c*) What is Semaphore ? Explain Bounded-Buffer problem.

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

   (*a*)   What is Fragmentation ? Explain types of fragmentation with suitable example.

   (*b*)   Explain tree-structured directories along with its advantages and disadvantages.

   (*c*)   Consider the following snapshot of a system with 5 processes P_0, P_1, P_2, P_3, P_4 and three resource types A, B, C :

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	2	3	2	9	7	5	3	3	2
P_1	4	0	0	5	2	2			
P_2	5	0	4	11	0	4			
P_3	4	3	3	4	4	4			
P_4	2	2	4	6	5	5			

      Answer the following questions using Banker's algorithm.

      (*i*)   What are the contents of need matrix ?

      (*ii*)   Is the system in a safe state ? If yes, find safe sequence.

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

   (A)   (*i*)   What is critical section problem ? Give Peterson's solution to solve critical section problem. [4]

         (*ii*)   Write a short note on deadlock prevention stratergies. [4]

         (*iii*) Write benefits of virtual machine. [2]

Or

(B) (*i*) Consider the following page replacement string :

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2

How many page faults would occur for the LRU page replacement algorithm (Assume three frames). [4]

(*ii*) Write a note on multilevel queue scheduling. [4]

(*iii*) Differentiate between user level thread and kernel level thread. [2]

Total No. of Questions—4]   [Total No. of Printed Pages—4

Seat
No.

[5316]-402

T.Y. B.Sc. (Sem. IV) EXAMINATION, 2018

COMPUTER SCIENCE

Paper II

(CS-342 : Compiler Construction)

(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*) Neat diagrams must be drawn wherever necessary.

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

(*a*) What is a cross compiler ?

(*b*) What is the purpose of flow graph ?

(*c*) List any *two* LEX library functions.

(*d*) Define Memory Binding.

(*e*) Define the term dead code.

(*f*) Terminals can have synthesized attributes, but not inherited attributes. State true *or* false.

(*g*) Define the term lexeme.

(*h*)   Define SDD. (Syntax Directed Definitions)

(*i*)   List the different types of conflicts that occur in LR parser.

(*j*)   What is the use of Dynamic Pointer.

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

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

       S → A

       A → aA|Ad

       B → bBC|f

       C → g

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

(1) $(a + a * (b - c)) + ((b - c) * d)$

(2) $((a + b) * (c - d))/f * (a + b)$

(*c*)   Consider the following SDD and find the dependency graph for the expression — 7 * 5 :

Production rules	**Semantic rules**
S→AB	B.inh = A.val
	S.val = B.syn
B→*AB$_l$	B$_l$.inh = B.inh * A.val
	B.syn = B$_l$.syn
B→C	B.syn = B.inh
A→digit	A.val = digit.lexval

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

    (*a*)   Consider the following grammar :

$$E \rightarrow E+T \mid T$$
$$T \rightarrow T*F \mid F$$
$$F \rightarrow id$$

          Construct the operator precedence relation table and find the precedence functions.

    (*b*)   Consider the following grammar and parse the input string "211221" using shift-reduce parser. Show the contents of stack, input and action taken at each stage :

$$S \rightarrow 1B \mid 2A$$
$$A \rightarrow 1 \mid 1S \mid 1AA$$
$$B \rightarrow 2 \mid 2S \mid 1BB$$

    (*c*)   Explain in detail any *two* code optimization techniques with appropriate examples.

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

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

$$S \rightarrow A \mid ab$$
$$A \rightarrow aAb \mid B$$
$$B \rightarrow a$$

        (*b*)   Write a Recursive Descent Parser (RDP) for the following grammar :   4

$$S \rightarrow AB$$
$$A \rightarrow Aa \mid a$$
$$B \rightarrow Bb \mid b$$

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

$$N \rightarrow V=E \mid E$$

$$E \rightarrow V$$

$$V \rightarrow a \mid *E$$

(*b*)   Write the steps to construct syntax tree using the semantic rules. Construct a syntax tree for the following SDD :   [4]

Production rule	Semantic rules
$E \rightarrow E_1+T$	E.node = new Node ('+', E_1.node, T.node)
$E \rightarrow E_1-T$	E.node = new Node ('–', E_1.node, T.node)
$E \rightarrow T$	E.node = T.node
$T \rightarrow (E)$	T.node = E.node
$T \rightarrow id$	T.node = new Leaf (id, id.entry)
$T \rightarrow num$	T.node = new Leaf(num, num.val)

Total No. of Questions—4] [Total No. of Printed Pages—3

Seat
No.

[5316]-403

T.Y. B.Sc. (Sem. IV) EXAMINATION, 2018

COMPUTER SCIENCE

Paper III

(CS-343 : Computer Networks–II)

(2013 PATTERN)

Time : Two Hours Maximum Marks : 40

N.B. :— (i) Neat diagrams must be drawn wherever necessary.

(ii) *All* questions are compulsory.

(iii) Figures to the right indicate full marks.

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

(a) What are the types of backbone networks ?

(b) Draw BSS with access point.

(c) Identify the class of the following IP addresses :

192.168.60.12

10.11.1.1

(d) What is purpose of ARP ?

(e) What is window size of TCP segment ?

(*f*)   What is DNS ?

(*g*)   What is Role of packet filter ?

(*h*)   What is transposition cipher ?

(*i*)   State the purpose of the LLC Layer.

(*j*)   Define subnetting.

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

(*a*)   Explain the format of the MAC address with its types.

(*b*)   What is Routing ? Explain the desirable characteristics.

(*c*)   Write a short note on different types of user agents.

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

(*a*)   Explain four cases on ARP.

(*b*)   Write a short note on UDP.

(*c*)   What is Cryptography ? Explain two cryptographic principles.

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

(A)   (1)   Explain any *four* features supported by TCP.   [4]

       (2)   Write a note on Virtual LAN.   [4]

       (3)   Draw the frame format of Ethernet.   [2]

Or

(B) (1) For the given IP address 144.10.37.24/28 in some block address, calculate :

        (*a*)   Address mask

        (*b*)   First address of the Block

        (*c*)   Last address of the Block

        (*d*)   Number of addresses in the Block.   [4]

    (2) Write a note on Java applet security.   [4]

    (3) Define the terms : Ad hoc Network and infrastructure network.   [2]

Total No. of Questions—4] [Total No. of Printed Pages—3

Seat
No.

[5316]-404

T.Y. B.Sc. (Sem. IV) EXAMINATION, 2018

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*) *All* questions carry equal marks.

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

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

(*a*) Write any *two* Ajax applications.

(*b*) List the special operators used in JavaScript.

(*c*) Superglobals can not be used as variable variables inside functions or class methods. Justify true or false.

(*d*) What is XML namespaces ?

(*e*) List the different features of HTTP.

(*f*) What is use of XML ?

P.T.O.

(*g*)   Write down the limitations of JavaScript.

(*h*)   Define the use of Die( ).

(*i*)   How can a user present the status of radio button ?

(*j*)   Which information is stored by $-FILES ?

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

(*a*)   Discuss any *five* elements of $-SERVER superglobal variable.

(*b*)   Draw and explain Ajax web application model.

(*c*)   Explain the JavaScript confirm dialog box with suitable example.

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

(*a*)   Write a PHP script to accept two strings. Concatnate second string to first string by using sticky forms.

(*b*)   Write PHP script to read book.xml file which contain book number, name of book, name of author, publisher, price. Print book details of specific author in tabular format after accepting name of author as input.

(*c*)   Write an Ajax program to search student name according to the character typed and display same list using array.

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

    (A)   (1)   Write a PHP script to accept borrower details (bno, bname, bph) on first page. On second page accept EMI No, EMI amt etc. on third page print borrower information (bno, bname, bph, EMI no, EMI amt). [4]

            (2)   Explain how to send email with php. [4]

            (3)   State onmouseover and onkeypress JavaScript events. [2]

Or

    (B)   (1)   Explain the different methods of including JavaScript in HTML. Write suitable example. [4]

            (2)   Discuss how Email id validation and verification is done in PHP. [4]

            (3)   Write a short note on SSL. [2]

Total No. of Questions—4]   [Total No. of Printed Pages—3

Seat
No.   **[5316]-405**

T.Y. B.Sc. (Sem. IV) EXAMINATION, 2018

COMPUTER SCIENCE

Paper V

(CS-345 : Programming in Java–II)

(2013 PATTERN)

Time : Two Hours   **Maximum Marks : 40**

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

(*ii*)   *All* questions carry equal marks.

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

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

(*a*)   List any *four* collection interfaces.

(*b*)   State the use of iterator with its syntax.

(*c*)   When to use execute update (string sql) method ?

(*d*)   Name the statement types used for executing SQL queries.

(*e*)   Which method is used to send the cookie from server to the client ? Give syntax.

(*f*)   Which JSP tag is used to give declaration ?

(*g*)   List any *two* differences between Servlet and JSP.

P.T.O.

(*h*) What is Multithreading ?

(*i*) "Java can control different types of multitasking" True/False—
Justify.

(*j*) State any *two* methods of socket class.

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

(*a*) Write a JDBC program to display information about table such
as column labels, number of columns and column type

(Table name is stud and Database name is Exam)

(*b*) Explain life cycle of servlet.

(*c*) What are two different ways used to implement threading in
Java ? Explain with example.

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

(*a*) Explain JDBC architecture in detail.

(*b*) Write a servlet program which display the current date and
time.

(*c*) Explain scripting elements in JSP.

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

(A) (*a*) Write a program to create a linklist of four integer objects
and do the following operations.

(*i*) Add element at first position

(*ii*) Delete last element. [4]

(*b*)   What is Servlet ? State its advantages.   [4]

(*c*)   Explain the purpose of yield( ) method in the context of thread.   [2]

Or

(B)   (*a*)   List implicit objects in JSP and explain any *two* implicit objects in JSP.   [4]

(*b*)   What is URL ? Explain any *four* URL class methods in detail.   [4]

(*c*)   Write any *two* differences between Array List and Linked List.   [2]

Total No. of Questions—4]   [Total No. of Printed Pages—3

Seat
No.

[5316]-406

T.Y.B.Sc. (Sem. IV) EXAMINATION, 2018

COMPUTER SCIENCE

Paper VI

(CS-346 : Computer Graphics)

(2013 PATTERN)

Time : Two Hours   Maximum Marks : 40

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

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Use of calculator is allowed.

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

(*a*)   What is the refresh buffer ?

(*b*)   What is the function of pick device ?

(*c*)   What is plasma panel ?

(*d*)   State 4-connected and 8-connected methods.

(*e*)   Define shear.

(*f*)   What is perspective projection ?

(*g*)   What is the use of Warnock's algorithm ?

(*h*) State the purpose of 3D clipping.

(*i*) Write any *two* disadvantages of Daisy-wheels printer.

(*j*) What is scan conversion ?

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

(*a*) Using Bresenham's line algorithm find out which pixel be turned on for the line with end points (4, 4) to (12, 9).

(*b*) A polygon co-ordinates are :

A(7, 3), B(9, 3), C(9, 5) and D(7, 5).

We have done scaling $S_x = S_y = 2$ and reflation through origin and translation by 1 in both x and y-direction. Find the original figure.

(*c*) Clip the line PQ having co-ordinate A(4, 1) and B(6, 4) against the clip window having vertices :

A(3, 2), B(7, 2), C(7, 6) and D(3, 6)

using Cohen Sutherland line clipping algorithm.

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

(*a*) Write the difference between Raster and Vector graphics.

(*b*) Explain DDA line generation algorithm.

(*c*) What is orthographic parallel projection ? Explain.

4. Attempt (A) *or* (B) :   [4+4+2=10]

    (A) (*a*)   What is parametric line-clipping algorithm ? Explain Cyrus Beck Line clipping algorithm.   [4]

          (*b*)   What is viewport ? Explain viewing pipeline.   [4]

          (*c*)   Write any *four* echo types for choice device.   [2]

Or

    (B) (*a*)   Explain with a diagram direct view storage tube. [4]

          (*b*)   Differentiate between object space method and image space method.   [4]

          (*c*)   Give any *two* functions of data Glave device.   [2]

Total No. of Questions—5]   [Total No. of Printed Pages—4+2

Seat No.

[5316]-5

F.Y B.Sc. (Computer Science) EXAMINATION, 2018

ELECTRONIC SCIENCE

Paper I

(ELE-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.
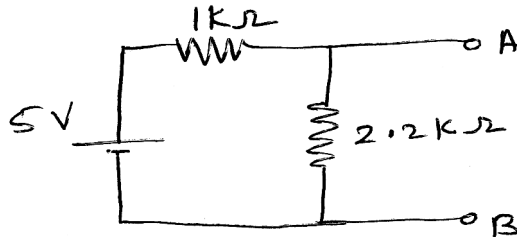
    (*iii*) Figures to the right indicate full marks.

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

    (*a*) State working principle of transformer.

    (*b*) Draw symbols for photodiode and varactor diode.

    (*c*) Calculate voltage drop across 2.2 kΩ resistor :

(d) Define Q point and list the factors affecting stability of the transistor.

(e) Give sign conventions for Kirchhoff's voltage law.

(f) Draw output I-V characteristics of BJT in CE mode and show all regions in it.

(g) In JFET circuit drain current changes by 20 mA, when V_{GS} changes by 2 V at a constant drain source voltage. Calculate drain resistance.

(h) Define the terms differential mode gain and common mode gain of an op-amp.

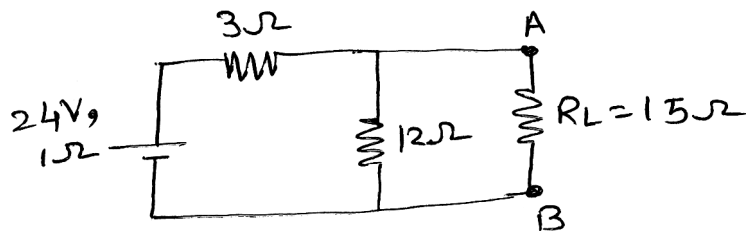2. Attempt any *four* of the following :   [4×4=16]

(a) Explain the classification of capacitors.

(b) Find the value of R_L for which maximum power will be transferred for the following circuit :
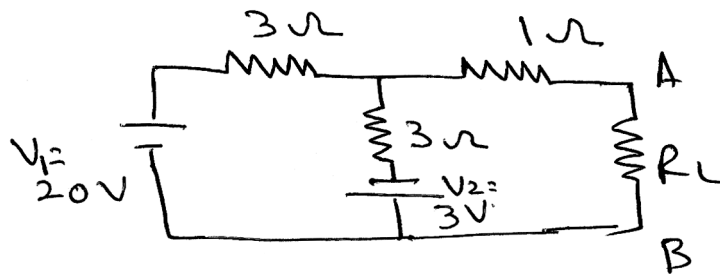
(*c*) With the help of a neat circuit diagram explain the action of Zener diode as a regulator.

(*d*) Explain the frequency response for a single stage R.C. coupled amplifier.

(*e*) Explain the working of n-channel JFET with suitable diagram.

(*f*) Explain the action of Schmitt trigger using operational amplifier.

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

(*a*) Define the following parameters related to operational amplifiers :

(*i*) Output impedance

(*ii*) PSRR

(*iii*) Output offset voltage

(*iv*) Input bias current.

(*b*) Explain the working of MOSFET as a switch.

(*c*) Distinguish between JFET and BJT.

(*d*) Explain the working principle of optocoupler.

(*e*) Calculate current through load resistor 15 Ω by using Thevenin's theorem :

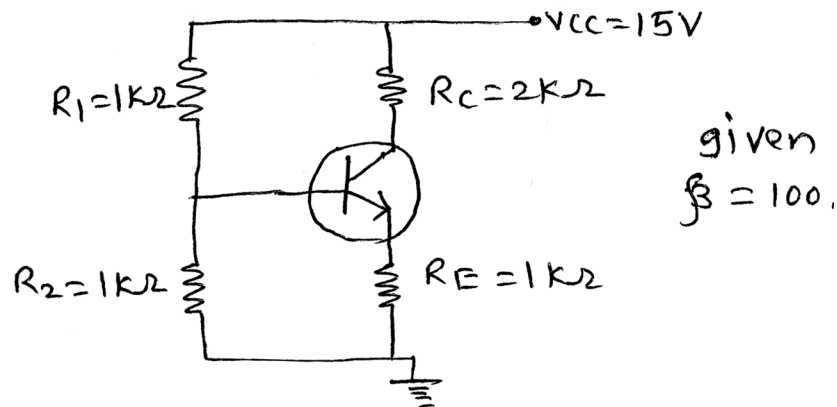(*f*) Explain SPDT and push to ON switch in detail.

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

(*a*) Calculate coordinates of d.c. loadline for a silicon transistor in a circuit :

(*b*) Define intrinsic stand-off ratio for UJT. Calculate intrinsic stand-off ratio if R_{B1} = 6 kΩ, R_{B2} = 4 kΩ.

(*c*) Explain the concept of virtual ground in an op-amp.

(*d*) State the application of the following types of transformers :

(*i*) Step-up

(*ii*) Step-down

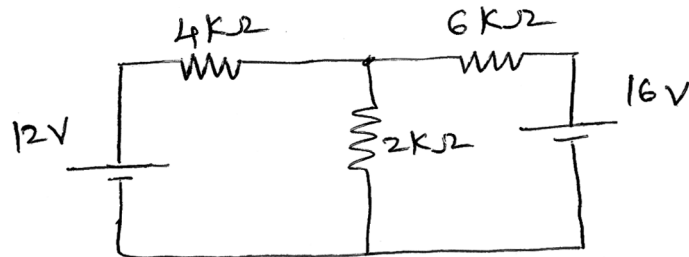(*iii*) Isolation

(*iv*) Centre tapped.

(*e*) Draw Norton's equivalent circuit for the following circuit :
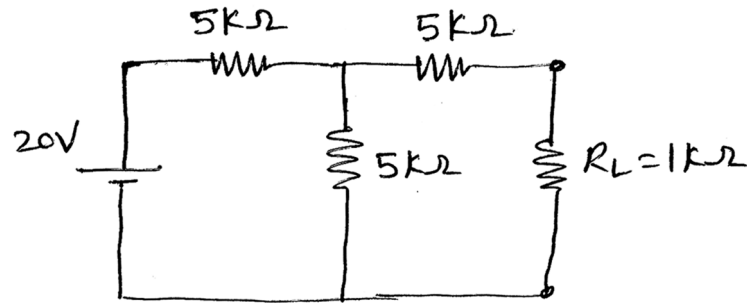
(*f*) Explain the working of series dipper.

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

(*a*) (*i*) Explain working principle of optical fibre cable.

(*ii*) Calculate current through 2 kΩ resistor using Kirchhoff's laws :

(*b*) (*i*) Distinguish between CB, CE and CC configurations of transistor.

(*ii*) Recognize the application of op-amp and find output voltage for the following circuits :

4KΩ

2KΩ

0.5V

2KΩ

−0.3V

(2)

4KΩ

V_o
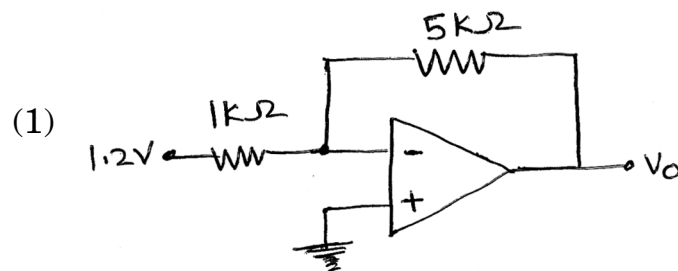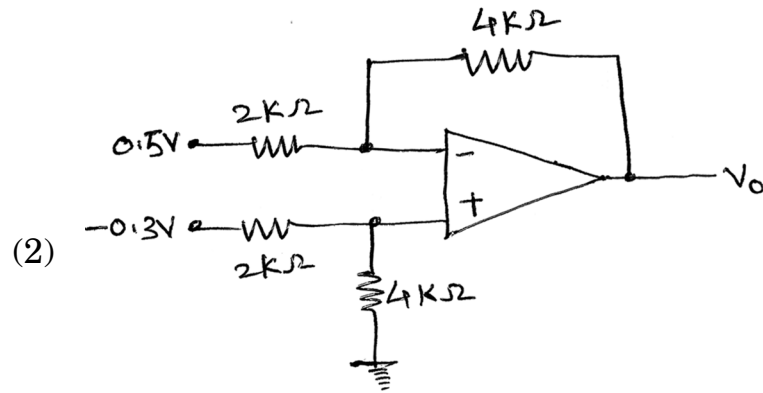
(c) (i) Define α and β for transistor. Derive the relation between α and β.

(ii) Derive the expression for discharging current of a capacitor and plot the graph of discharging current *versus* time.

Seat No.	

[5316]-6

F.Y.B.Sc. (Computer Science) EXAMINATION, 2018
ELECTRONIC SCIENCE
Paper-II
ELC-102 : Principles of Digital Electronics
(2013 PATTERN)

Time : Three Hours　　　　　　　　　　**Maximum Marks : 80**

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

　　　　(*ii*)　Neat diagrams must be drawn wherever necessary.

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

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

　(*a*)　Express $(-32)_{10}$ in 8-bit signed magnitude form.

　(*b*)　Simplify the expression Y = A . (A + B).

　(*c*)　What will be the addition of the following numbers :

　　　　1101.01, 0101.10

　(*d*)　For a demultiplexer having 64 outputs, find the number of control lines required.

　(*e*)　Mention any *two* applications of shift registers.

　(*f*)　Draw the symbol of tristate inverter and write its truth table.

　(*g*)　Differentiate between encoder and decoder.

　(*h*)　Find the time required to load 8-bit data serially in a register if the duration of clock pulse is 10 µsec.

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

   (*a*)   Convert the following :

   (*i*) $(10110)_2 = (?)_{10}$

   (*ii*) $(181)_{10} = (?)_{16}$

   (*b*)   Convert the given expression into standard SoP form :

   $Y = \overline{A}B + BC + C\overline{A}$

   (*c*)   Draw the logic diagram and give the truth table for :

   (*i*)   Half Adder

   (*ii*) Half Subtractor.

   (*d*)   Explain the working of 4 : 1 multiplexer using AND-OR gates.

   (*e*)   With a neat logic diagram explain the working of clocked R-S flip-flop.

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

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

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

   (*i*)   2-input AND gate

   (*ii*) 2-input OR gate.

   (*b*)   Construct NOR gate and NOT gate using NAND gates.

   (*c*)   Explain the working of 4-bit parallel adder with the help of a neat diagram.

   (*d*)   Draw the logic diagram for decimal to binary converter and explain its working.

   (*e*)   Show the connections of IC 7490 for mod-4 and mod-7 operation.

   (*f*)   Define the parameters for logic gates :

   (*i*)   Propagation delay

   (*ii*) Fan-out

   (*iii*) Logic levels

   (*iv*) Noise margin.

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

(*a*) Explain the concept of '+ve logic' and '–ve logic' in case of logic gates.

(*b*) Simplify the given expression using *k* map. Draw the simplified diagram :

$$Y = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,B\,\overline{C} + A\,\overline{B}\,\overline{C} + AB\overline{C}$$

(*c*) With a neat block diagram explain the working of 1-bit comparator.

(*d*) Draw the block diagram of BCD to 7 segment conversion. For the BCD inputs 2 and 8, what will be the 7 segment outputs ? Assume the display to be of common anode type.

(*e*) With the help of neat logic diagram explain the working of 3-bit serial-in-serial out right shift operation.

(*f*) Write a note on logic families.

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

(*a*) (*i*) Explain the working of 3-bit parity generator circuit with suitable diagram.

(*ii*) Subtract $(43)_{10}$ from $(81)_{10}$ using 25 complement method.

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

(*c*) (*i*) State and prove De-Morgan's theorems.

(*ii*) Explain the process of key identification in case of 3×4 keyboard matrix encoder.

[5316]-6 3

Total No. of Questions—5]   [Total No. of Printed Pages—8

Seat
No.

[5316]-7

F.Y B.Sc. (Computer Science) EXAMINATION, 2018

STATISTICS

Paper I

(Statistical Methods-I)

(2013 PATTERN)

Time : Three Hours   Maximum Marks : 80

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

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

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

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

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

(*i*)   Less than cumulative frequency of the last class is ....

(*ii*)   Mean and standard deviation of a random variable X are 5 and 4 respectively. Then standard deviation of (4 – 3X) is ....

(*iii*)   The long-term regular movement in a time series is called as ....

(*iv*)   Karl Pearson's coefficient of correlation lies between .... and ....

P.T.O.

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

(*i*) For a moderately skewed distribution, if mean is 30 and
mode is 36, the median of the distribution is ....

(*a*) 32

(*b*) 30

(*c*) 28

(*d*) 40

(*ii*) If $X \to B\left(3, \dfrac{1}{2}\right)$ and $Y \to B\left(5, \dfrac{1}{2}\right)$ and X and Y are

independent, then distribution of X + Y is ....

(*a*) B(8, 1)

(*b*) $B\left(8, \dfrac{1}{2}\right)$

(*c*) $B\left(8, \dfrac{1}{4}\right)$

(*d*) $B\left(5, \dfrac{1}{2}\right)$

(*iii*) In a trivariate data, the correlation coefficient between
any two variables when the third variable is held constant
is called as ....

(*a*) simple correlation coefficient

(*b*) multiple correlation coefficient

(*c*) partial correlation coefficient

(*d*) multiple regression

(*iv*) If $\mu_3 = -8$ and $\mu_2 = 3$, the distribution is ....

    (*a*) positively skewed

    (*b*) negatively skewed

    (*c*) platykurtic

    (*d*) symmetric

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

    (*i*) State additive property of Poisson distribution.

    (*ii*) State any *two* properties of distribution function of a discrete random variable.

    (*iii*) Find the median of the following observations :

              61, 62, 63, 62, 63, 64, 62, 64, 60, 65.

    (*iv*) State additive model of time series.

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

(A) Define :

    (*i*) Class limits

    (*ii*) More than cumulative frequency

    (*iii*) Open end class

    (*iv*) An attribute.

(B) State requisites of a good measure of central tendency.

(C) Weight in mg of 20 residuals are given below. Prepare stem and leaf chart :

50   46   31   49   33   42   55   37   36   35   65   57

27   37   42   33   51   46   31   37

(D) Mean hourly salary of 50 employees in a firm is Rs. 88.40. Frequency distribution of salaries of these employees in which some frequencies are missing is given below :

Salary	Frequency
40—60	6
60—80	—
80—100	17
100—120	—
120—140	5

Find the missing frequencies.

(E) Explain absolute and relative measures of dispersion.

(F) Find mean and standard deviation of first 15 natural numbers.

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

(A) Define mode. Describe the procedure to compute mode for grouped frequency distribution.

(B) Explain the concept of skewness of a frequency distribution. State any *two* measures of skewness.

(C) For a distribution the mean is 10, standard deviation is 3, $\beta_1 = 1$ and $\beta_2 = 3.5$. Obtain first four central moments.

(D) Given the following distribution function of a r.v. X :

X	F(x)
–3	0.04
–2	0.23
–1	0.56
0	0.82
1	0.93
2	1.00

Find :

(i) Probability mass function (p.m.f.) of X

(ii) Mean of X.

(E) State probability mass function of Poisson distribution. State the conditions when binomial distribution can be approximated by Poisson distribution.

(F) A shooter is hitting at a target. The probability of not hitting the target at any shot is 0.7. What is the probability that the shooter will hit the target at fourth attempt for the first time ? Also find expected number of shots required until the target is hit for the first time.

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

(A) (*i*) Find number of pairs of observations from the following data :

$r = -0.4$, $\Sigma x = 100$, $\Sigma x^2 = 2250$

$\Sigma y = 100$, $\Sigma y^2 = 2250$, $\Sigma xy = 1900$.

(*ii*) Describe the stepwise procedure of fitting $y = ab^x$ using principle of least square.

(B) (*i*) Let X follow binomial distribution with mean 3 and variance 2.1 :

(1) Find n and p

(2) Find $p(0 < x < 2)$

(3) Find $p(x \geq 2)$.

(*ii*) Explain concept of multiple correlation coefficient in a trivariate data. State the expression for the multiple correlation coefficient $R_{1.23}$.

(C) (*i*) Define regression coefficients for a bivariate data. State any *two* properties of regression coefficients.

(*ii*) In the regression analysis the equations of two lines of regression are :

$2X + 3Y = 8$ and $2Y + X = 5$ and variance of X is 4.

Find :

(1) Mean values of X and Y

(2) Coefficient of correlation between X and Y

(3) Standard deviation of Y.

(D) (*i*) What is time series ? Explain seasonal variations in a time series.

(*ii*) The standard deviation of distribution is 5. What should be the value of fourth central moment in order that the distribution is mesokurtic and leptokurtic ?

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

(A) (*i*) Karl Pearson's coefficient of correlation between X and Y obtained from 10 pairs of observations is 0.5. Mean of X and Y are 12 and 15 respectively. Standard deviations are 3 and 4 respectively. While checking it was noticed that one pair of observation was wrongly entered as (16, 9) instead of (26, 18). Calculate correct coefficient of correlation.

(*ii*) Write the stepwise procedure of fitting the curve $y = a + bX + cX^2$ using method of least squares.

(B) (*i*) Estimate trend using 4 yearly centered moving averages :

Year	Population (in tonnes)
2000	78
2001	73
2002	71
2003	73
2004	75
2005	78
2006	73
2007	77
2008	70
2009	69

(*ii*)   If X_1, X_2 and X_3 are the variables measured from their means, obtain the equation of regression of X_3 on X_1 and X_2 from the following information :

σ_1 = 2.7 $\qquad\qquad$ σ_2 = 2.4 $\qquad\qquad$ σ_3 = 2.7

r_{12} = 0.28 $\qquad\qquad$ r_{13} = 0.5 $\qquad\qquad$ r_{23} = 0.49

Also estimate X_3 when X_1 = 4 and X_2 = 6.

Total No. of Questions—5]   [Total No. of Printed Pages—8

Seat
No.   **[5316]-8**

F.Y. B.Sc. (Computer Science) EXAMINATION, 2018
STATISTICS
(Statistical Methods-II)
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*) Use of non-programmable, scientific calculators and statistical
                  tables is allowed.
         (*iv*) Symbols have their usual meanings unless otherwise stated.

1.   (A)   Fill in the blanks :   [1 mark each]
            (*i*)   An event A which contains only one element of sample
                    space is called as ....
            (*ii*) If two events A and B are mutually exclusive, then
                    P (A∪B) = ...
            (*iii*) If random variable X follows uniform distribution in
                    (–2, 2), then its mean is ....
            (*iv*) The standard deviation of a statistic is called as ....
      (B)   Select most appropriate option for each of the following :
                                                    [1 mark each]
            (*i*)   Var(5X–2) =
                    (*a*) 5*Var(X)
                    (*b*) 25*Var(X)
                    (*c*) 5*Var(X–2)
                    (*d*) 25*Var(X)–2

                                                    P.T.O.

(*ii*) Let A and B be any *two* events defined on Ω, then P (A ∩ B) =

(*a*) P(A) + P(B)

(*b*) P(A)*P(A/B), P(A)>0

(*c*) P(A)*P(B/A), P(A) > 0

(*d*) P(A) * P(A/B), P(B) > 0

(*iii*) Given three aribitrary events A, B and C defined on Ω, then the expression for the event "occurrence of at least one of the events" is :

(*a*) A ∪ B ∪ C

(*b*) B ∩ A ∪ C

(*c*) B ∪ (A ∩ C)

(*d*) A ∩ B ∩ C

(*iv*) Probability of Rejecting H_0 when H_0 is true is called as :

(*a*) Statistic

(*b*) Parameter

(*c*) Sample

(*d*) Level of significance

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

    (*i*)   A continuous random variable X has the probability density function (p.d.f.)

$$f(x) = \begin{cases} k, & 2 \le x \le 5 \\ 0, & otherwise \end{cases}$$

    Find the value of *k*.

    (*ii*)   If X has Pareto distribution with $\alpha = 4$, find the mean of X.

    (*iii*)   State normal approximation to Poisson distribution.

    (*iv*)   State Box-Muller transformations.

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

(*a*) Find the total number of three digit numbers that can be formed from six digits 2, 3, 5, 6, 7 and 9. How many of these are less than 500 ?

(*b*) Three coins are tossed together. The events are defined as below :

A : Exactly 2 coins show heads

B : At least 2 coins show heads

List the elements of A and B. Verify whether A and B are mutually exclusive ?

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

    (*i*)   Discrete sample space

    (*ii*)   Non-deterministic experiment.

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

   (*i*) All the vowels come together.

   (*ii*) The vowels occupy odd places.

(*e*) State axioms of probability. Also, prove that "If A and B are two events defined on Ω, such that A is subset of B, then P(A) ≤ P(B)."

(*f*) An event A is such that it is three times as probable as the event A^c. Find P(A).

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

(*a*) Define independence of two events A and B defined on a sample space Ω. Can they be independent and mutually exclusive simultaneously ? Justify your answer.

(*b*) The events A_1, A_2 and A_3 form a partition of sample space. If $P(A_1) = P(A_2) = P(A_3) = 1/3$, $P(B/A_1) = 2/7$, $P(B/A_2) = 4/9$, $P(B/A_3) = 1/5$, find $P(A_1/B)$.

(*c*) Define each of the following :

   (*i*) Exhaustive events

   (*ii*) Sure event

   (*iii*) Intersection of two events

   (*iv*) Permutation.

(*d*) If X → U[a, 10] and P(3<X<7) = 1/2, find the value of *a*.

(*e*) Define each of the following :

   (*i*) Continuous random variable

   (*ii*) Expectation of a continuous random variable.

(*f*)   If X → N(5, 16), find :

(*i*)   P(5 ≤ X ≤ 7)

(*ii*) P(3X + 7 > 24).

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

(*a*)   (*i*)   Define normal distribution. State *two* properties of normal distribution.

(*ii*) The failure time of a component X is assumed to have an exponential distribution with mean of 100 hours. Find the probability that any particular component will :

(1)   last at least for 200 hours and

(2)   last between 250 and 300 hours.

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

(*ii*) In a laboratory experiment, 18 determinations of the coefficient of friction between leather and metal yielded the following results :

0.49, 0.56, 0.49, 0.55, 0.45, 0.55, 0.51, 0.4, 0.56, 0.47, 0.58, 0.41, 0.54, 0.48, 0.51, 0.57, 0.43, 0.56.

Test using sign whether population median is 0.5 at 5% level of significance (l.o.s.).

(*c*)   (*i*)   Explain the method of drawing a model sample from a uniform (a, b) distribution.

(*ii*) In a sample of 500 parts manufactured by a company, the number of defective parts was found to be 42. The company, however, claimed that 6% of their product is defective. Test the claim at 5% level of significance.

(*d*) (*i*) Describe procedure of run test.

(*ii*) Define probability density function of a continuous random variable. Also, verify whether the following function can be considered as a valid probability density function :

$$f(x) = \begin{cases} \dfrac{3x(2-x)}{4}, & 0 \le x \le 2 \\ 0, & \text{otherwise} \end{cases}$$

5. Attempt any *one* of the following :

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

SRSWOR

Null hypothesis

Statistic

Critical region

(*ii*) The table below gives the number of customers visiting a certain Post office on various days of the week :

Days	Number of Customers
Monday	130
Tuesday	120
Wednesday	110
Thursday	115
Friday	110
Saturday	135

Test whether the customers visiting the post office are uniformly distributed. Use 5% l.o.s.   [4]

(*iii*) Memory capacity of 10 students was tested before and after training and are as follows : [8]

Roll No.	Before Training	After Training
1	12	15
2	14	16
3	11	10
4	8	7
5	7	5
6	10	12
7	3	10
8	0	2
9	5	3
10	6	8

Test whether the training was effective or not. Use 5% l.o.s.

(*b*) (*i*) Explain the large sample test for testing $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$. [4]

(*ii*) A random sample of 90 adults is classified according to gender and the number of hours they watch television during a week :

Time spent watching television during a week	Gender	
	Male	Female
Over 25 hours	15	29
Under 25 hours	27	19

Test whether the time spent in watching television is independent of gender at 5% level of significance. [4]

(*iii*) Given the following information about two variables X and Y : [8]

$$n = 10, \sum_{i=1}^{10} x_i = 55, \sum_{i=1}^{10} y_i = 40, \sum_{i=1}^{10} x_i^2 = 385,$$

$$\sum_{i=1}^{10} y_i^2 = 192, \sum_{i=1}^{10} x_i y_i = 185$$

(1) Compute the value of correlation coefficient between X and Y.

(2) Test the significance of correlation coefficient between X and Y at 1% l.o.s.