

S.Y.B.Sc. CS  
Jan - 2019 = F.C. II

S.Y.B.Sc. (C.S.)

Foundation course

Jan  
2019

Con. 543-18.

(3 Hours)

BM-6387

Total Marks : 80

- Note: 1) All questions are Compulsory.  
2) Figures to the right indicate full marks.

Section I

1. Answer any four questions from the following (5x4)
- What is National Commission for Women?
  - Discuss the effects of Hybrid disasters.
  - What are the distinctive features of technology?
  - What is Chipko Movement?
  - Discuss Right to Information.
  - What are the various forms of Violations of Right
2. Answer any four questions from the following: (5x4)
- Define and discuss Disaster Mitigation.
  - Discuss the meaning and characteristics of Science.
  - What is right to Education Act and what are its challenges?
  - What are the main functions performed by NGOs?
  - Discuss the stages in Team Building.
  - What are the salient features of Effective Listening.

Section II

3. Answer any four questions from the following: (5x4)
- Define Environmental Degradation. What are its main causes?
  - 'Genetically modified food has its effects on environment'. Discuss
  - 'Nuclear Power can endanger the future of mankind'. Comment.
  - What is Disaster Management? State the main factors involved in it.
  - Explain in detail the Consumer Protection Act.
  - Discuss briefly some of the Air borne diseases.
4. Answer any four questions from the following: (5x4)
- Explain the major problems of mega cities in India.
  - What is 'Carbon Trading'. How does it protect the environment.
  - Explain the different types of Cyber Crime.
  - Define Nanotechnology. Describe any two applications of Nanotechnology.
  - Define Space Technology. Discuss the benefits of Space Technology
  - What is Eco-feminism?

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[N.B.: All questions are Compulsory]  
Section I

1. Write note on **Any Three** of the following: (6x3)
- Stages in Team Building.
  - The Chipko Movement.
  - Forms of Violations of Rights.
  - Hybrid Disasters.
  - Listening Skills.
2. Attempt **Any Two** of the following: (8x2)
- The Narmada Bachao Andolan is actively working for the protection of the Environment and Human Rights. Illustrate.
  - Define NHRC. What are the main functions of the National Human Rights Commission of India?
  - Comment on the basic principles that make science unique.
3. Attempt **Any Two** of the following: (8x2)
- Discuss the difference and importance of verbal and non-verbal communication.
  - What is Right to Education Act? Discuss few challenges faced by education sector in India
  - Define Fundamental Rights. Illustrate Right to Equality

Section II

4. Write note on **Any Three** of the following: (6x3)
- Global Positioning System (GPS).
  - Cyber crime.
  - Eco-feminism
  - A-biotic Component
  - Time Management.
5. Attempt **Any Two** of the following: (8x2)
- Discuss briefly some of the Air borne diseases.
  - What is Public Interest Litigation (PIL)? Elaborate the need for PIL.
  - What is 'Carbon Trading'. How does it protect the environment
6. Attempt **Any Two** of the following: (8x2)
- 'Nuclear Power can endanger the future of mankind'. Comment.
  - Explain the major problems of mega cities in India.
  - Define Space Technology. Discuss the benefits of Space Technology.

S.Y. B.Sc C.S  
Jan - 2019

= Maths - I

S.Y. B.Sc (C.S.)

(Maths-I)

Jan  
2019

Con. 552-18.

BM-6681

(3 Hours)

[Total Marks : 100

**N.B. :** (1) All questions are **compulsory**.

(2) In **each** question, from question Nos. 2 to 7 part 'a' is compulsory. Attempt any **one** question from part 'b' and part 'c'.

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

1. Attempt any **two** of the following :—

(a) State and prove Hausdroff property of  $\mathbb{R}$ . 10

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

(c) Find the average height of the paraboloid  $z = x^2 + y^2$  over the square  $0 \leq x \leq 2, 0 \leq y \leq 2$ .

2. (a) State and prove arithmetic and geometric mean inequality for  $a > 0, b > 0$  in  $\mathbb{R}$ . 8

(b) Prove that  $l.u.b. (-A) = -g.l.b. (A)$ . 7

(c) Show that set of all the limit points of the set  $(a, b) = [a, b]$ . 7

3. (a) State and prove Bolzano weitstrass theorem for sequences. 8

(b) Show that the sequence  $0.3, 0.33, 0.333, \dots$  is monotonic and bounded. Also find limit of the sequence. 7

(c) Show that  $\langle (-1)^n \rangle$  is not a Cauchy sequence. 7

4. (a) State and prove Leibnitz test for convergence for an alternating series. 8

(b) Test the converges of  $\sum_1^\infty \frac{1}{4n^2 + 8n + 3}$ . 7

(c) Obtain the Fourier expansion of  $f(x) = x$  in the interval  $-\pi < x < \pi$ . 7

[ TURN OVER

5. (a) If  $y_1(x)$  is a non-zero solution of  $y'' + Py' + Qy = 0$  then prove that the second 8

linearly independent solution is given by  $y_2(x) = y_1(x) \int \frac{1}{y_1^2} e^{\int P dx} dx$ .

- (b) Solve  $(x + y - 1) dx + (x + y + 1) dy = 0$ . 7

- (c) Solve  $y'' - 5y' + 6y = x^2 e^{2x}$  using method of variation of parameter. 7

6. (a) Verify Fubini's Theorem for the following integral. 8

$$\int_0^3 \int_0^{\sqrt{9-y^2}} 2y dx dy.$$

- (b) Evaluate  $I = \iiint_D xyz dv$  Where  $D$  is the portion of the sphere  $x^2 + y^2 + z^2 = a^2$  7  
lying in the first octant.

- (c) Using polar co-ordinates evaluate  $\int_0^{\sqrt{2}} \int_y^{\sqrt{4-y^2}} \frac{dx dy}{1+x^2+y^2}$ . 7

7. (a) Verify Green's theorem for  $\int_c (2x - y + 4) dx + (5y + 3x - 6) dy$  where 'c' is the triangle 8  
with vertices  $(0,0)$ ,  $(3,0)$  and  $(3,2)$  having positively oriented boundary.

- (b) Evaluate  $\int_c (2 + x^2 y) ds$  where 'c' is the upper half an unit circle  $x^2 + y^2 = 1$ . 7

- (c) Find a function  $f$  such that  $F = \Delta f$ , where  $F(x, y) = (3 + 2xy, x^2 - 3y^2)$ . Evaluate 7  
 $\int_c F dr$  where  $c$  is the curve given by  $r(t) = e^t \sin t i + e^t \cos t j, 0 \leq t \leq \pi$ .

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N.B. : (1) All questions are **compulsory**.

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

1. Attempt any **four** of the following :—

16

- (a) For  $a, b \in \mathbb{R}$  if  $a < b$  then prove that  $a < \frac{a+b}{2} < b$ .
- (b) Prove that  $l.u.b. (-A) = -g.l.b. (A)$ .
- (c) State and prove Hausdroff property of  $\mathbb{R}$ .
- (d) Prove that 0 is the only limit point of the set  $S = \left\{ \frac{1}{n} / n \in \mathbb{N} \right\}$ .
- (e) Prove that the set  $H = (0, 1)$  is not compact.
- (f) Prove that "Every convergent sequence is bounded".

2. Attempt any **four** of the following :—

16

- (a) Prove that "Every absolute convergent series is convergent".
- (b) Find the sum of the infinite series  $\sum_n \frac{n+1}{2^n}$ .
- (c) Obtain the Fourier expansion of  $x^2$  in the interval  $-\pi < x < \pi$ .
- (d) Solve  $\frac{dy}{dx} = xy + x + y + 1$ .
- (e) Solve  $(2x - 5y + 3) dx - (2x + 4y - 6) dy = 0$ .
- (f) Solve  $y'' + 4y = x^2$  using UDC method.

3. Attempt any **four** of the following :—

16

- (a) Find the average height of the paraboloid  $z = x^2 + y^2$  over the square  $0 \leq x \leq 2, 0 \leq y \leq 2$ .

- (b) Evaluate  $\int_0^1 \int_0^x (x^2 + y^2) dy dx$  by changing to polar coordinates.

[ TURN OVER

(c) Evaluate  $I = \int_0^{2\pi} \int_0^2 \int_0^{4-r^2} r dz dr d\theta$ .

(d) Find the divergence and curl of  $F(x,y) = (x^2 - y)\bar{i} + (xy - y^2)\bar{j}$ .

(e) Evaluate  $\int_c (2 + x^2y) ds$  where 'c' is the upper half an unit circle  $x^2 + y^2 = 1$ .

(f) Find a function f such that  $\Delta f = 3 + 2xy, x^2 - 3y^2$ .

Evaluate  $\int_c F dr$  where c is the curve given by  $r(t) = e^t \sin t \bar{i} + e^t \cos t \bar{j}, 0 \leq t \leq \pi$ .

4. Attempt any four of the following :—

16

(a) Solve  $(x^2 + y^2) dx - 2xy dy = 0$ .

(b) Find the area between the parabola  $y^2 = 4ax$  and  $x^2 = 4ay$ .

(c) Obtain the differential equation for the relation  $y = a.e^{2x} + b.e^{3x}$  Where a,b are constants.

(d) Show that the sequence 0.2, 0.22, 0.222,..... is monotonic and bounded. Also find limit of the sequence.

(e) Find radius of convergence of  $\sum_{n=1}^{\infty} (-1)^n \frac{x^{2^n+1}}{(2n+1)!}$

(f) Show that  $\langle (-1)^n \rangle$  is not a Cauchy sequence.

5. Attempt any four of the following :—

16

(a) Show that set of all the limit points of the set  $(a, b) = [a, b]$ .

(b) Test the converges of  $\sum_1^{\infty} \frac{1}{4n^2 + 8n + 3}$ .

(c) Show that "if  $a > 0$  than  $\frac{1}{a} > 0$ , for  $\forall \alpha \in \mathbb{R}$ ".

(d) Show that  $\sqrt{8}$  is not a rational number.

(e) Show that the closed interval  $[a, b]$  in  $\mathbb{R}$  is not an open set.

(f) Show that  $\lim_{n \rightarrow \infty} \frac{1}{x}$  does not exist.

S.Y. B.Sc. CS = Maths - II

JAN - 2019

S.Y. B.Sc. (C.S.)  
(MATHS - II)

JAN  
2019

Con. 548-18.

BM-6121

(3 Hours)

[Total Marks: 80

N.B. : (1) All Questions are Compulsory.

(2) Each question carries 16 marks.

(3) Internal choices are there in each question.

(4) Figures to the Right indicate Full marks.

Q.1 Attempt any four questions from the following.

16

(a) Find the Rank of the matrix  $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 10 & 4 \\ 2 & 8 & 3 \end{bmatrix}$

(b) Find the inverse of the matrix  $A = \begin{bmatrix} 4 & -5 & -2 \\ 5 & -6 & -2 \\ -8 & 9 & 3 \end{bmatrix}$

(c) Solve by Cramer's rule:-

$$x + y + z = 7, x + 2y + 3z = 6, x + 3y + 4z = 2$$

(d) Find Eigen values of the matrix  $\begin{bmatrix} 0 & 255 & 563 \\ 0 & 7 & 665 \\ 0 & 0 & -3 \end{bmatrix}$

(e) Find Eigen values of  $A^3 + 7I$  if  $A$  has Eigen values 1 & -2

(f) Prove that Eigen space  $W$  is a subspace of a vector space.

Q.2 Attempt any four questions from the following.

16

(a) Let  $W_1$  and  $W_2$  be subspaces of Vector space  $V$ . Then prove that  $W_1 + W_2$  is also a subspace of  $V$ .

(b) Define following with example: - 1. Dimension 2. Subspace

[TURN OVER

- (c) Show that the Vectors  $X_1=(1,-1)$ ,  $X_2=(2,3)$  &  $X_3=(3,2)$  are linearly dependent.
- (d) Prove that the set  $S= \{(x, x, 0) / x \text{ is real}\}$  is a subspace of  $\mathbb{R}^3$
- (e) If  $W_1$  &  $W_2$  are subspaces of a vector space  $V$ . Prove that  $W_1 \cap W_2$  is always a subspace.
- (f) Show that a superset of a linearly dependent set is linearly dependent.

Q.3 Attempt any **four** questions from the following.

16

- (a) Define and explain orthonormal basis with an Example.
- (b) Let  $V$  be inner Product space. If  $x, y$  are any two vectors in  $V$  then Prove that  $\|x + y\| \leq \|x\| + \|y\|$
- (c) Use Gram-Schmidt process to find orthonormal basis for  $\mathbb{R}^3$  for the vectors  $x_1 = (2, 1, 0)$  and  $x_2 = (1, 0, -2)$  &  $x_3 = (0, 1, 0)$ .
- (d) Let  $V$  be inner Product space. Prove that  $\langle u, 0 \rangle = 0$  for every vector  $u$  in  $V$ .
- (e) Check whether the function  $\langle x, y \rangle = ac + bd$  where  $x = (a, b)$  &  $y = (c, d)$  define on  $\mathbb{R}^2$  is inner product.
- (f) State & Prove Parallelogram Equality of inner product space.

Q.4 Attempt any **four** questions from the following.

16

- (a) Find  $\text{Adj}A$  for the matrix  $A = \begin{bmatrix} 2 & 4 \\ 3 & 1 \end{bmatrix}$
- (b) Prove that  $(\text{Adj}A) A = |A|I$
- (c) Prove that  $(AB)^{-1} = B^{-1}A^{-1}$
- (d) Verify  $\det(AB) = \det(A)\det(B)$  for  $A = \begin{bmatrix} 2 & 4 \\ 3 & 1 \end{bmatrix}$  &  $B = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$
- (e) Eigen values corresponding to distinct Eigen values are L.I.
- (f) Find Eigen values of  $A^{-1}$  for the matrix  $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$



Q.5 Attempt any four questions from the following.

16

(a) Define linear Transformation with an example.

(b) Show that  $T: P_2[x] \rightarrow R^3$  given by  $T(Ax^2+Bx+C) = (A, B, C)$  is a linear Transformation.

(c) Let  $T: R^2 \rightarrow R^2$  be a linear Transformation such that  $T(2, 1) = (4, -1)$  &  $T(1, 3) = (1, 0)$  find  $T(3, 1)$ .

(d) Let  $T: R^2 \rightarrow R^2$  be a linear Transformation such that  $T(x, y) = (y, x)$ . Prove that  $T$  is invertible.

(e) Let  $V$  be a Vector space and  $T: V \rightarrow V$  is a linear transformation. Prove that  $T$  is injective iff  $\ker T = \{0\}$ .

(f) Define Kernel of  $T$  and image of  $T$



[TURN OVER

N.B. (1) ALL QUESTIONS ARE COMPULSORY

(2) FROM QUESTION 2 TO 7, SUBQUESTION (a) IS COMPULSORY AND ATTEMPT ANY ONE FROM REMAINING

Q.1 Attempt any one: -

[10]

(a) State & Prove Rank Nullity Theorem.

(b) Let  $W_1$  and  $W_2$  be subspaces of Vector space  $V$ . Then prove that  $W_1 + W_2$  is also a subspace of  $V$ . further prove that  $\dim(W_1 + W_2) = \dim W_1 + \dim W_2 - \dim(W_1 \cap W_2)$ .

Q.2 (a) Show that any square matrix  $A$  can be expressed as sum of symmetric & Skew-symmetric matrices. [8]

(b) Reduce the matrix  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$  in to Row echelon form. [7]

OR

(b) Solve the following by using Gauss elimination method [7]

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

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

$$3x + y + 4z = 6$$

Q.3 (a) Let  $B = \{v_1, v_2, \dots, v_n\}$  be finite set of a vectors in  $V$ . Then prove that following statements are equivalent [8]

(I)  $B$  is a basis of  $V$

(II)  $B$  is a maximal linearly independent set in  $V$

(b) Show that the Vectors  $X_1=(2,3,1)$ ,  $X_2=(1,2,0)$  &  $X_3=(1,1,1)$  are linearly dependent. [7]

OR

(b) Define Subspace of a vector space & Prove that the set  $S = \{(x, x-y, x+y) \mid x, y \text{ are real}\}$  is a subspace of  $R^3$ . [7]

Q.4 (a) State & Prove Pythagorean theorem of inner product space. [8]

(b) Use Gram-Schmidt process to find orthonormal basis for  $\mathbb{R}^3$  for the vectors  $x_1 = (1, 3, 1)$  and  $x_2 = (1, 0, 1)$  &  $x_3 = (0, 0, 3)$ . [7]

OR

(b) Let  $V$  be inner Product space. If  $x, y$  are any two vectors in  $V$

$\|x+y\|=4, \|x-y\|=6$  &  $\|x\|=3$  find  $\|y\|$  [7]

Q.5 (a) If  $U$  is a subset of  $V$ , then Complement of  $U$  is a subspace of  $V$ . [8]

(b) Let  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be a linear Transformation such that  $T(1, 3) = (3, -1)$  &  $T(3, 2) = (-2, 3)$  find  $T(x, y)$  for all  $(x, y)$  in  $\mathbb{R}^2$  & hence find  $T(3, 4)$  [7]

OR

(b) Show that  $T: P_2[x] \rightarrow \mathbb{R}^2$  given by  $T(Ax^2+Bx+C) = (A, C)$  is a linear Transformation. Is it Invertible? Justify your answer? [7]

Q.6 (a) Let  $V$  be a Vector space and  $S = \{v_1, v_2, \dots, v_n\}$  be a finitely linearly independent set in  $V$ , Prove that if  $y \in L(S)$  if and only if  $S \cup \{y\}$  is linearly dependent. [8]

(b) Find the inverse of  $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & -1 \\ 3 & 3 & 2 \end{bmatrix}$  by using adjoint method. [7]

OR

(b) Solve the following system by using Cramer's rule [7]

$$7x + 5y - 3z = 16, 3x - 5y + 2z = -8, 5x + 3y - 7z = 0$$

**[TURN OVER**

Con. 548-BM-6121-18

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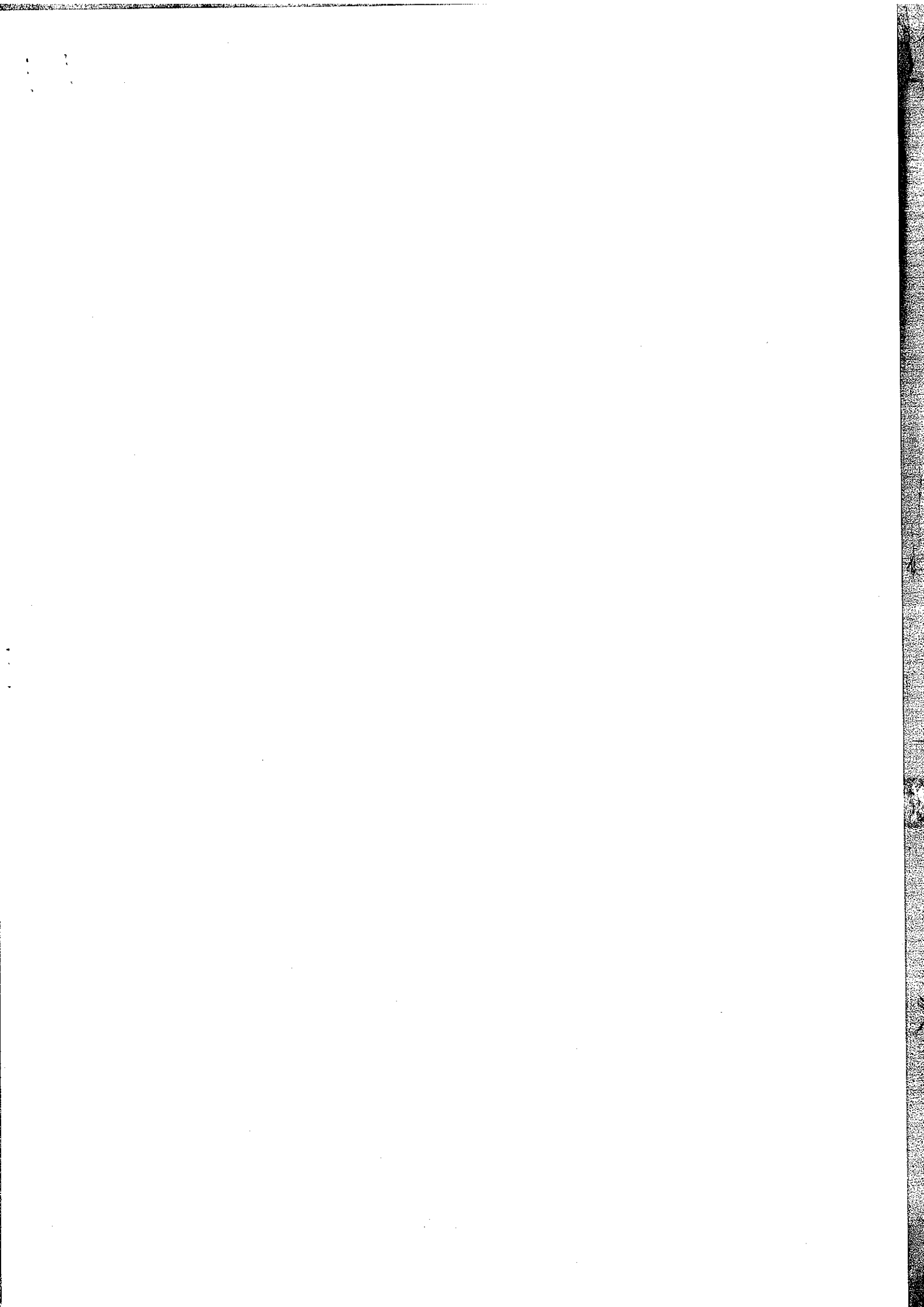
Q.7 (a) Find the Eigen values & Eigen vectors for  $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$  [8]

(b) Define Eigen Space and prove that Eigen space is a subspace of a Vector space. [7]

OR

(b) Prove that if  $x$  is an Eigen value of matrix  $A$  then  $x^{-1}$  is an Eigen value of  $A^{-1}$ . [7]

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Con. 549-18.

BM-6585

[Total Marks : 48

N.B. : (1) All Questions are Compulsory.

(2) All Questions carry equal marks.

(3) Figures to the right indicate full marks.

(4) Use of Non-Programmable Scientific Calculator is allowed.

Q.1 Attempt any Two of the following.

(8 M)

(a) Design an algorithm to find factorial of positive integer.

(b) State and Prove Handshaking Lemma.

(c) By Euler's Method solve  $\frac{dy}{dx} = x^2 + y^2$  given  $y(0)=1$  and find  $y(1)$  take  $h=0.5$

(d) Solve  $x^2 + 2x - 2 = 0$  by using Bisection method (two approximation).

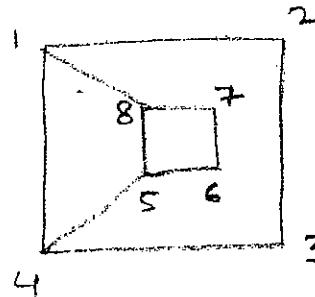
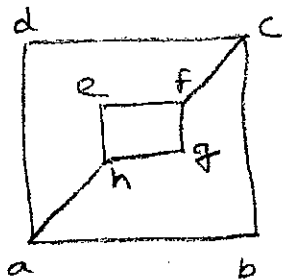
Q.2 Attempt any Two of the following.

(10 M)

(a) Define Complete and Regular Graph and explain the difference between them.

(b) Draw all Possible Sub graphs of  $K_3$ .

(c) Check whether the following graphs are Isomorphic or Not.



(d) Check whether the following graphs are Planar or Not.

(p)  $K_{23}$  (q)  $K_5$

Q.3 Attempt any Two of the following.

(10 M)

(a) Write Steps to find minimum Spanning Tree in Krushkal's Algorithm for weighted graph.

(b) Show that the number of Odd Vertices in a graph is even.

(c) Define Eulerian and Hamilton Graph with Examples.

(d) Draw a Graph corresponding to matrix  $\begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$

[Turn Over

Q.4 Attempt any Two of the following.

(10 M)

- (a) By Milne Simpsons predictor-corrector method to solve  $\frac{dy}{dx} = xy$  given  $y(1)=1$  and Find  $y(1.2)$ .

(b) Evaluate  $\int_0^{\infty} 5^{-x^2} dx$

(c) Evaluate  $\int_0^{\infty} \frac{1}{1+x^2} dx$

- (d) Find the Area of  $y=x^2$  about X-axis from 0 to 1.

Q.5 Attempt any Two of the following.

(10 M)

- (a) Solve  $2x + y = 12$ ,  $3x + 2y = 8$  by using Do-little's Decomposition method.
- (b) Find the root of the equation  $x - e^x = 0$  by False position method.
- (c) Find  $\sqrt{7}$  by Newton Raphson method.
- (d) By Taylor's Method solve  $\frac{dy}{dx} = x + y$  find  $y(0.2)$  given  $y(0)=1$ .

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- N.B.:** (1) All Questions are Compulsory.  
 (2) All Questions carry equal marks.  
 (3) Figures to the right indicate full marks.  
 (4) Use of Non-Programmable Scientific Calculator is allowed.

Q.1 Attempt any Two of the following. (10 M)

- (a) Design an algorithm to find whether an input number is Prime or not.  
 (b) State and Prove Handshaking Lemma.  
 (c) Define Eulerian and Hamilton Graph with Examples.  
 (d) Design an algorithm to find gcd of two input positive numbers.

Q.2 Attempt any Two of the following. (10 M)

- (a) Draw a Graph corresponding to matrix  
 (b) Define following with example.  
     (i) Complete Graph      (ii) Bipartite Graph  
 (c) Design an algorithm to find sum of first five positive integer.  
 (d) Check whether the following graphs are Planar or Not.  
     (i)  $K_{33}$       (ii)  $K_4$

Q.3 Attempt any Two of the following. (10 M)

- (a) Let T be a graph with n vertices. Prove that following statements are equivalent  
     (i) T is a Tree.  
     (ii) T is connected & every edge is cut edge.  
 (b) Show that the number of Odd Vertices in a graph is even.  
 (c) If a Binary tree has 200 nodes then find number of leaf nodes.  
 (d) Write Steps to find minimum Spanning Tree in Prim's Algorithm for weighted graph.

Q.4 Attempt any Two of the following. (10 M)

(a) Discuss the convergence of  $\int_0^{\infty} \frac{1}{1+x^3} dx$

(b) Evaluate  $\int_0^{\infty} 3^{-x^2} dx$

(c) Evaluate  $\int_0^{\infty} \frac{1}{1+4x^2} dx$

(d) Find the area of a region bounded between two curves  $y = 2\sin x$  and  $y = \sin 2x$ ,

where  $0 \leq x \leq \pi$

[Turn Over

Q.5 Attempt any Two of the following.

(10 M)

(a) Solve the following system of equations using Crout's method (if applicable) :  
 $x + 2y = 10$ ,  $3x + y = 15$ .

(b) Find the root of the equation  $3x - e^x = 0$  by False position method.

(c) Find  $\sqrt{11}$  by Newton Raphson method.

(d) Solve  $x^2 + x - 1 = 0$  by using Bisection method up to third approximation.

Q.6 Attempt any Two of the following.

(10 M)

(a) By Taylor's Method solve  $\frac{dy}{dx} = 2xy$  find  $y(1.1)$  given  $y(1)=2$ .

(b) Derive Secant recurrence formula.

(c) Find  $A^{-1}$  using block multiplication, where  $A = \begin{bmatrix} 1 & 2 & 0 & 0 \\ 2 & 3 & 0 & 0 \\ 0 & 0 & 5 & 6 \\ 0 & 0 & 6 & 7 \end{bmatrix}$

(d) By Euler's Method solve  $\frac{dy}{dx} = \frac{x+y}{2x+3y}$  find  $y(1.2)$  given  $y(1)=1$  take  $h=0.1$ .

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Time: 2Hrs.

Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 4 marks.

## Section - I

- Q.1 Answer any TWO of the following: [8M]
- (a) Solve the recurrence relation:  $5F_{n-1} - 6F_{n-2}$ .
  - (b) State and prove De Morgan's Law.
  - (c) Consider the set  $A = \{4, 5, 6, 7\}$ . Let R be the relation  $\leq$  on A. Draw the directed graph and the Hasse diagram of R.
  - (d) What are different ways to describe a set? Explain each giving an example.
- Q.2 Answer any TWO of the following: [8M]
- (a) Explain breadth first algorithm.
  - (b) Prove that conjunction operation is commutative.
  - (c) Let E denote the following algebraic expression  
 $[a + (b - c)] * [(d - e) / (f + g - h)]$   
 Represent E with binary tree T. Also state the preorder traversal of E.
  - (d) Explain the terms Square Matrix, diagonal Matrix, Boolean Matrix And Transpose of matrix.
- Q.3 Answer any TWO of the following: [8M]
- (a) How many Four digit number can be formed by using digits 1,3,5,7 when repetition of digit is not allowed.
  - (b) Suppose a department contains 13 professors. Show that at least two of them have their birthdays in the same month.
  - (c) Explain pigeonhole principle.
  - (d) Find the number of permutation for the letter of the word PEPPER and ALGEBRA.

## Section - II

- Q.4 Answer any TWO of the following: [8M]
- (a) State and explain DDA line algorithm.
  - (b) Explain the terms i) scaling ii) Translation
  - (c) Write applications of computer graphics.
  - (d) Explain the Bresenham's line drawing algorithm with example
- Q.5 Answer any TWO of the following: [8M]
- (a) Explain Computer Graphics.
  - (b) Explain character clipping and its techniques.
  - (c) Write short note on workstation transformation.
  - (d) Consider the line from (0,0) to (-6,-6). Use simple DDA to rasterize this line.
- Q.6 Answer any TWO of the following: [8M]
- (a) Discuss Z-buffer algorithm.
  - (b) Write a Short note on Shadows and texture mapping
  - (c) Discuss the steps in Animation
  - (d) What are different shading techniques? Explain any one in detail.

Max. Marks:60

Time: 2Hrs.

Instructions:

1. All questions are compulsory.
2. Attempt any TWO sub-questions from each question.
3. Each sub-question is of 5 marks.

## Section - I

- Q.1 Answer any TWO of the following: [2X5=10]
- (a) Solve the recurrence relation:  $F_n = 5F_{n-1} - 6F_{n-2}$ .
  - (b) State and prove De Morgan's Law.
  - (c) Consider the set  $A = \{4, 5, 6, 7\}$ . Let R be the relation  $\leq$  on A. Draw the directed graph and the Hasse diagram of R.

- Q.2 Answer any TWO of the following: [2X5=10]
- (a) Explain depth first algorithm
  - (b) Prove that conjunction operation is commutative.
  - (c) Let E denote the following algebraic expression  $[a + (b - c)] * [(d - e) / (f + g - h)]$   
Represent E with binary tree T. Also state the preorder traversal of E

- Q.3 Answer any TWO of the following: [2X5=10]
- (a) Determine the number of ways in which 5 teachers and 6 doctors be seated so that no two teachers be seated together.
  - (b) Explain pigeonhole principle.
  - (c) Find the number of permutation for the letter of the word ALLAHABAD and CANADA

## Section - II

- Q.4 Answer any TWO of the following: [2X5=10]
- (a) Explain the terms i) scaling ii) Translation
  - (b) Write applications of computer graphics.
  - (c) Explain the Bresenham's line drawing algorithm with example

- Q.5 Answer any TWO of the following: [2X5=10]
- (a) Write the properties of bezier curves.
  - (b) Explain character clipping and its techniques.
  - (c) Write short note on workstation transformation.

- Q.6 Answer any TWO of the following: [2X5=10]
- (a) Discuss Z-buffer algorithm.
  - (b) Write a Short note on Shadows and texture mapping
  - (c) Discuss the steps in Animation

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Comp. Sci - II

Jan  
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Con. 545-18.

(2 Hours)

[Total Marks : 60

- N.B. :** (1) All questions are compulsory.  
(2) Figures to the right indicate full marks.  
(3) Mixing of sub-questions is not allowed.

### Section I

1. Answer any two questions from the following :— 10  
(a) Enlist and explain important features of OOPS.  
(b) What does class consist of ? What is instance of a class ? Give an example of both.  
(c) Write a short note on Constructors and Destructors.
2. Answer any two questions from the following :— 10  
(a) Enlist the rules for Overloading Operators.  
(b) Write a short note on Virtual Base classes and Pointer to Objects.  
(c) Explain pure virtual functions.
3. Answer any two questions from the following :— 10  
(a) Explain Function Templates with multiple parameters.  
(b) Write a short note on Components of STL.  
(c) Write a note on Classes for File Stream Operations.

### Section II

4. Answer any two questions from the following :— 10  
(a) Explain string arithmetic in java with an example.  
(b) Write a note on accessing instance variables of a class.  
(c) Write a note on Java features.
5. Answer any two questions from the following :— 10  
(a) Explain final classes in java with an example.  
(b) Explain try and Multiple catch clause mechanism.  
(c) Explain how to implement interfaces in java.
6. Answer any two questions from the following :— 10  
(a) Write the steps and code to create a simple applet with "welcome" as title.  
(b) Explain painting, repainting and updating an applet.  
(c) Write a note on Circle, arcs, polygons.  
(d) Explain AWT controls: labels, buttons, textfield.

[TURN OVER

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(2 Hours)

[Total Marks : 48]

- N.B. :** (1) All questions are compulsory.  
(2) Figures to the right indicate full marks.  
(3) Mixing of sub-questions is not allowed.

**Section I**

1. Answer any **two** questions from the following :— 8
  - (a) Enlist and explain the benefits of OOP's.
  - (b) Explain call by value in function with an example.
  - (c) Explain user defined type and object with example.
  - (d) Write a program to illustrate use of Relational & Logical Operators.
2. Answer any **two** questions from the following :— 8
  - (a) Write a short note on Virtual Functions.
  - (b) Explain Multilevel, Multiple inheritance. Give an example.
  - (c) What are Unary operators ? How to overload unary operators.
  - (d) Explain the concept Pointers to Derived Classes.
3. Answer any **two** questions from the following :— 8
  - (a) Write a short note on Opening and Closing a File.
  - (b) What are Class Templates ? Give an example.
  - (c) Explain Function Templates.
  - (d) What are the Applications of Container classes.

**Section II**

4. Answer any **two** questions from the following :— 8
  - (a) Write a note on conditional and relational operator.
  - (b) Explain switch statement in java with example.
  - (c) Explain constructor overloading in java.
  - (d) Explain protected access and private access in java.
5. Answer any **two** questions from the following :— 8
  - (a) Explain keywords- 'extends', 'super' with suitable example.
  - (b) Write a note on dynamic dispatch method.
  - (c) Write a note on Exception-handling fundamentals in java.
  - (d) Explain InputStream and OutputStream.
6. Answer any **two** questions from the following :— 8
  - (a) Write a note on applet life cycle.
  - (b) How to draw lines and rectangle in java applet ? Illustrate with an example.
  - (c) Write a note on Component, Container.
  - (d) Explain AWT controls: textarea, checkboxes with example.



- N.B. : (1) All Question are compulsory.  
(2) All question carry equal marks.  
(3) Draw diagrams wherever necessary.

S.Y.B.Sc (C.S.)  
COMP. Sci. - III

### Section-I

1. Attempt the following (Any two):- (10)
- Write advantage and disadvantage of DBMS.
  - What is Entity? Explain entity versus attributes and entity versus Relationship with example.
  - List any 5 limitations of DBMS.
2. Attempt the following (Any two):- (10)
- Define joins .Explain Conditional, Equal and Natural joins.
  - Write purpose of the following while solving queries.
    - Where clause
    - Keyword Distinct
    - Function Max
    - Order by clause
    - Keyword Set
  - Explain any 5 String functions with example.
3. Attempt the following (Any two):- (10)
- Define Triggers. Explain how to create, insert and delete triggers.
  - What is indexing? Explain TREE and Hash based indexing.
  - State advantage and disadvantage of view.

### Section-II

4. Attempt the following (Any two):- (10)
- Explain waterfall model. Write its strength and weakness.
  - Explain the steps involved in SDLC.
  - Shortly explain the 3 approaches towards software system development.
5. Attempt the following (Any two):- (10)
- Write characteristics and component of SRS.
  - Write elements of object model and basic principles of OO approach.
  - Draw a Use Case diagram for Banking System.
6. Attempt the following (Any two):- (10)
- Explain Abstraction and its types.
  - What is V & V? Explain its types.
  - How to design a good user interface.

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- N.B. : (1) All Question are compulsory.  
 (2) All question carry equal marks.  
 (3) Draw diagrams wherever necessary.

### Section-I

1. Attempt the following (Any two):- (8)
  - (a) Write advantage and disadvantage of DBMS.
  - (b) What is Entity? Explain entity versus attributes and entity versus Relationship with example.
  - (c) Explain the 3 Normal forms.
  - (d) List any 5 limitations of DBMS.
  
2. Attempt the following (Any two):- (8)
  - (a) Define joins .Explain Conditional,Equal and Natural joins.
  - (b) Define Relation. Differentiate between selection and projection.
  - (c) Write purpose of the following while solving queries.
    - i) Where clause
    - ii) Keyword Distinct
    - iii) Function Max
    - iv) Order by clause
    - v) Keyword Set
  - (d) Explain any 5 String functions with example.
  
3. Attempt the following (Any two):- (8)
  - (a) Define Triggers. Explain how to creat, insert and delete triggers.
  - (b) What is indexing? Explain TREE and Hash based indexing.
  - (c) State advantage and disadvantage of view.
  - (d) How to implement triggers.

### Section-II

4. Attempt the following (Any two):- (8)
  - (a) Explain waterfall model. Write its strength and weakness.
  - (b) Write role of metrics and models in project management.
  - (c) Explain the steps involved in SDLC.
  - (d) Shortly explain the 3 approaches towards software system development.
  
5. Attempt the following (Any two):- (8)
  - (a) Write characteristics and component of SRS.
  - (b) Write elements of object model and basic principles of OO approach.
  - (c) Explain Technical & Economical Feasibility.
  - (d) Draw a Use Case diagram for Banking System.
  
6. Attempt the following (Any two):- (8)
  - (a) Explain Abstraction and its types.
  - (b) What is V & V? Explain its types.
  - (c) How to design a good user interface.
  - (d) Draw a DFD for Food Ordering Unit.

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TURN OVER

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