

Total No. of Questions : 7]

SEAT No. :

PC4020

[Total No. of Pages : 2

[6349]-302

S.Y.M.Sc. (Industrial Mathematics with Computer Application)

MIM-302: ALGEBRA

(2019 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any five questions from Q2 to Q7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Scientific calculators and statistical tables are allowed.*

Q1) Solve any five of the following.

[5×2=10]

- a) Let $H = \{0,3\}$ be a subgroup of the group $G = (Z_6, +_6)$. Find the left and right cosets of H in G .
- b) Give an example of a
 - i) Finite non cyclic group and
 - ii) An infinite non cyclic group
- c) Express the following permutation in S_8 as a product of disjoint cycles: $(1,2)(4,7,8)(2,1)(7,2,8,1,5)$. Also find its order.
- d) Check whether the polynomial $x^2 + 1$ is irreducible in $Z_5[x]$.
- e) Give the characteristic of the following rings:
 - i) $Z_3 \times Z_4$
 - ii) $Z_6 \times Z_{15}$.
- f) Draw the Cayley table for $U(10)$.
- g) Show that in a group left cancellation law holds, that is $ba = ca$ implies $b = c$.

P.T.O.

- Q2)** a) State and prove Lagrange's theorem. [7]
 b) Determine the order of every element in the group $(\mathbb{Z}_6, +_6)$. [5]
- Q3)** a) Let G be a finite group of even order. Prove that there is at least one element $a \in G$, $a \neq e$ such that $a = a^{-1}$. [7]
 b) Find all normal subgroups of the group $(\mathbb{Z}_6, +_6)$. [5]
- Q4)** a) Let G be a group and let R be a relation defined on G by ' aRb ' if and only if $a = x^{-1}bx$, for some $x \in G$. Prove that R is an equivalence relation on G . Further show that if G is an abelian group then every conjugacy class is a singleton set. [6]
 b) Prove that intersection of normal subgroups is normal. [6]
- Q5)** a) Prove that $\frac{R}{I}$ is an Integral domain if and only if I is a prime ideal. [7]
 b) Give an example of a subring of $\mathbb{Z} \times \mathbb{Z}$ which is not an ideal of $\mathbb{Z} \times \mathbb{Z}$. Here \mathbb{Z} denotes the ring of integers. [5]
- Q6)** a) Prove that every field is an integral domain, but not conversely. [7]
 b) Find all the polynomials of degree 2 in $\mathbb{Z}_2[x]$. Which of those are irreducible? [5]
- Q7)** a) State and prove Eisenstein's Criterion for irreducibility of polynomials. [7]
 b) Prove that the intersection of any two subgroups of a group G is also a subgroup of G . Provide an example to illustrate your proof. [5]



Total No. of Questions : 8]

SEAT No. :

PC-4021

[Total No. of Pages : 2

[6349]-405

S.Y.M.Sc.

Industrial Mathematics With Computer Applications

MIM-405: MOBILE TECHNOLOGIES

(2019 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt any FIVE out of Eight questions given.*
- 2) Figures to the right indicate full marks.*
- 3) Neat diagrams must be drawn whenever necessary.*

Q1) Attempt the following questions:

- a) List different layouts in Android? Explain any One in Details. [5]
- b) What are the different programming languages used to develop android applications? Explain. [5]
- c) What is AndroidManifest.xml? Explain the purpose of it. [2]
- d) What is ViewGroup? [2]

Q2) Attempt the following questions:

- a) What are different layers of Android Architecture. [5]
- b) Differentiate TextView and EditText. [5]
- c) What is the purpose of string.xml. [2]
- d) What is Toast in Android? Give example. [2]

Q3) Attempt the following questions:

- a) List different types of Adapters in Android. [5]
- b) What is Menu? Which method is overridden for OptionMenu? Explain. [5]
- c) What is the purpose of ImageButton? [2]
- d) What is the purpose of the getWritableDatabase() method? [2]

P.T.O.

Q4) Attempt the following questions:

- a) Differentiate ListView and GridView. [5]
- b) What are the different methods to be overridden, when SQLiteOpenHelper class extended. [5]
- c) Write a note on Broadcast Receivers. [2]
- d) What is RatingBar? [2]

Q5) Attempt the following questions:

- a) Explain the life cycle of BoundService with neat diagram. [5]
- b) How ContentValues will help in SQLite. [5]
- c) List any five different version of Android. [2]
- d) What is DVM? [2]

Q6) Attempt the following questions:

- a) List and Explain different types Google Map Type. [5]
- b) Write down the methods belonging to DatePicker class. [5]
- c) Write in detail about ProgressBar. [4]

Q7) Attempt the following questions:

- a) Create an Android application to demonstrate phone call using implicit Intent. [5]
- b) What is PhoneGap? Write down its advantages and Disadvantages. [5]
- c) What is IOS? Explain its features. [4]

Q8) Attempt the following questions:

- a) Create an Android Application to find the addition of two numbers. [5]
- b) Explain the features of Swift Programming. [5]
- c) Explain Activity Cycle in detail. [4]



Total No. of Questions : 7]

SEAT No. :

PC-4994

[Total No. of Pages : 2

[6349]-501

T.Y. M.Sc. (Industrial Mathematics with Computer Application)

MIM-501 : NUMERICAL ANALYSIS

(2019 Pattern) (Semester - V)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q2 to Q7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculator is allowed.*

Q1) Solve any five of the following :

[10]

- a) Define the terms :
 - i) Round off error
 - ii) Percentage error
- b) Define the terms :
 - i) Fixed point
 - ii) Fixed point iteration
- c) What is the convergence rate of Newton Raphson method?
- d) Write a Lagrange's interpolation formula.
- e) Solve $\Delta(e^{ax} \sin bx)$
- f) Show that $E = 1 + \Delta$?
- g) Write a Regula-False formula. And Trapezoidal rule.

P.T.O.

- Q2) a)** Solve $4x_1 + 3x_2 - x_3 = -2$ [7]
 $-2x_1 - 4x_2 + 5x_3 = 20$
 $x_1 + 2x_2 + 6x_3 = 7$
 by using LU decomposition method.
- b)** Find the root of $x^3 - 3x + 2$ by using Newton Raphson method? [5]
- Q3) a)** State and prove Newtons cotes method. [7]
- b)** Construct a Forward difference table for the function $f(x) = x^3 - 3x + 2$ where $x = -1, 0, 1, 2, 3, 4, 5$ also find $f(5)$. [5]
- Q4) a)** State and prove centred order formula of order $O(h^2)$. [7]
- b)** Evaluate $\int_0^3 \frac{dx}{x+1}$ using Simpson's $\left(\frac{3}{8}\right)^{th}$ Rule (take $h = 0.5$). [5]
- Q5) a)** Solve $4x_1 + x_2 - x_3 = -2$ [7]
 $-2x_1 - 4x_2 + 5x_3 = 20$
 $x_1 + 2x_2 + 6x_3 = 7$
 by using Gauss -Seidel iterative method. (Perform 4 iterations).
- b)** Define triangular matrices, write down a property of triangular matrices. [5]
- Q6) a)** Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 8 & 10 \\ 0 & 8 & 6 \end{bmatrix}$ by using power method. [7]
- b)** Prove that General Eulers Formula $y_{n+1} = y_n + hf(x_n, y_n)$. [5]
- Q7) a)** Use Runge-Kutta method of second order to find a solution to the initial value problem $y' = x + y$ with $y(0) = 1$ at $x = 0.1$ and $x = 0.2$ (Take $h = 0.1$). [7]
- b)** Derive the Newton's backward interpolation formula. [5]



Total No. of Questions : 7]

SEAT No. :

PC-4999

[Total No. of Pages : 3

[6349]-502

T.Y. M.Sc.

(Industrial Mathematics with Computer Applications)

MIM-502 : COMPUTATIONAL GEOMETRY

(2019 Pattern) (Semester - V)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Question No. 1 is compulsory.
- 2) Attempt any five questions from Q. No. 2 to Q. No. 7.
- 3) Figures to the right indicate full marks.
- 4) Use of non-programmable scientific calculators is allowed.

Q1) Attempt any five of the following :

[5 × 2 = 10]

- a) If the line $y = 2x + 1$ is transformed to another straight line by 2×2 transformation matrix $[T] = \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix}$, find the slope and Y - intercept of transformed line.
- b) The lines $L_1 : 2x + 3y = 6$, $L_2 : -3x + 2y = 4$ are transformed to the lines L_1^*, L_2^* respectively under the transformation matrix $[T] = \begin{bmatrix} 3 & 1 \\ -1 & 1 \end{bmatrix}$. Find the point of intersection of L_1^* and L_2^* .
- c) Write the transformation matrices for an orthographic projection to create bottom and top view of an object.
- d) Find the parametric equation of a Be'zier curve determined by the control points $B_0[1 \ 0]$, $B_1[2 \ 3]$, $B_2[4 \ 1]$.
- e) Write the transformation matrix $[T]$ required to transform the plane $z = 0$ to the plane $z = 9$.
- f) Write any two properties of perspective projection.
- g) Find the value of $\delta\theta$ to generate 11 points on the parabolic segment $y^2 = 4x$, $2 \leq y \leq 4$.

P.T.O.

Q2) a) Prove that if a 2×2 transformation matrix transforms points P and Q to the points P^* and Q^* respectively, then the same transformation matrix transforms the midpoint of the line segment PQ to the midpoint of line segment P^*Q^* . [7]

b) Find the concatenated transformation matrix for the following sequence of transformations : [5]

i) Translate in Y - direction by 2 units

ii) Rotate about the origin through an angle -30° .

Also apply this combined transformation matrix on the line segment between the points A[1 2] and B[-2 4].

Q3) a) Write an algorithm for reflection through the line $y = mx + c$. [7]

b) Find the concatenated transformation matrix for the rotation about a point $(-2, 1)$ through an angle 35° . [5]

Q4) a) Explain the notion of foreshortening factors and determine the foreshortening factors f_x , f_y and f_z if the transformation matrix for

axonometric projection is given by $[T] = \begin{bmatrix} 0.5 & 0.43 & 0 & 0 \\ 0 & 0.86 & 0 & 0 \\ 0.86 & 0.25 & 0 & 0 \\ 3.58 & 0.75 & 0 & 1 \end{bmatrix}$. [7]

b) Obtain the transformation matrix for the translation in X, Y, Z directions by -1, 2 1 units respectively followed by rotation about Z axis by 90° followed by reflection in XY plane. [5]

Q5) a) Derive the transformation matrix for Oblique projection. [7]

b) Determine the isometric projection for $\phi = -45^\circ$ and $\theta = 35.26^\circ$, Also apply it on P[1 2 1]. [5]

Q6) a) Write an algorithm to generate uniformly spaced n points on the circle $(x - h)^2 + (y - k)^2 = r^2$. [7]

b) Generate uniformly spaced 8 points on the ellipse $\frac{x^2}{16} + \frac{y^2}{1} = 1$. [5]

Q7) a) Find the parametric equation of a Be'zier curve determined by the control points $B_0[0\ 2]$, $B_1[2\ 3]$, $B_2[3\ 2]$ and $B_3[2\ 0]$. Also find the position vectors of the points on the curve corresponding to parameter values $t = 0.2, 0.4, 0.6$. [7]

b) Write a short note on axonometric projection. [5]



Total No. of Questions : 8]

SEAT No. :

PC-5001

[Total No. of Pages : 3

[6349]-503

M.Sc. (I.M.C.A.)

MIM-503 : DATA ANALYSIS WITH PYTHON

(2019 Pattern) (Semester - V)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Attempt any Five questions out of eight.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt the following :

- a) Different between list and tuple Python. Explain with an example. [5]
- b) What is Dictionary? Justify dictionary is mutable or immutable. [5]
- c) Write any two features of Python. [2]
- d) Trace the output of following [2]
str1 = "Hello world"
print (str1 [2:9])
print(str1[: : -1])

Q2) Attempt the following :

- a) State and explain with example different types of operation on sets. [5]
- b) i) Write syntax of a function in Python? Give one example of it.
ii) Trace the output of the following. *Explain range() functon.*
for i in range (1,10,2):
print(i)
[5]
- c) Explain classes in python. [2]
- d) List any two advantages of files. [2]

P.T.O.

Q3) Attempt the following :

- a) Write a short note on types of Logical operators in Python with appropriate example. [5]
- b) What are modules in python? Explain. [5]
- c) What is seek () function? Explain with examples. [2]
- d) Write Python code to create a DataFrame using the following data: [2]
Name['Alice', 'Bob', 'Charlie']
Age= [25, 30, 35]
Salary=[50000, 60000, 70000]
Add a new column, Department, with values ['HR'. 'IT'. 'Finance'].

Q4) Attempt the following :

- a) What are packages? Give an example of package in python. [5]
- b) Explain following operations on file with syntax. [5]
 - i) read()
 - ii) readlines()
 - iii) open()
 - iv) write()
 - v) writelines()
- c) Explain with syntax and example, how the lists are updated in python. [2]
- d) What is the difference between .loc[] and .iloc[] in Pandas? [2]

Q5) Attempt the following :

- a) What is regular expression? What are different types of regular expression? [5]
- b) How exceptions are handled in python? Explain with examples. [5]
- c) Write a python script to check given number is prime or not. [4]

Q6) Attempt the following :

- a) What is Web framework? What are the advantages of using Django Web framework? [5]
- b) Explain any five-function of string in python with example. [5]
- c) Write a python code to print even number from a list. (use for and if loop). [4]

Q7) Attempt the following :

- a) Explain math module. List its functions. [5]
- b) Define function write a syntax to define function give example of function definition. [5]
- c) List the function to match a search pattern using regular expression. Explain. [4]

Q8) Attempt the following :

- a) Write a python code to pass a list to a function. Calculate summation of numbers from the list and then display the summation. [5]
- b) Write a short note on accessing attributes and built in attribute. [5]
- c) Write a python script to create queue and stack. [4]



Total No. of Questions : 7]

SEAT No. :

PC-5002

[Total No. of Pages : 2

[6349]-504

T.Y. M.Sc. (I.M.C.A.)

MIM-504 : DIGITAL IMAGE PROCESSING

(2019 Pattern) (Semester - V)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question No. 1 is compulsory.*
- 2) *Solve any five questions from questions from Q.2 to Q. 7.*
- 3) *Question 2 to 7 carry equal marks.*

Q1) Solve any five of the following :

[10]

- a) Define the terms :
 - i) Convex Hull
 - ii) Inverse Filtering
- b) What is digital image processing?
- c) What is texture?
- d) What is Band pass filters?
- e) State any two main types of high pass filtering.
- f) State any two sources of noise.?

Q2) Answer the following :

- a) Explain Fundamental steps in Digital Image Processing. **[7]**
- b) What are the applications of digital image processing? **[5]**

Q3) Attempt the following :

- a) Discuss image sharpening and Smoothing in the frequency domain. **[7]**
- b) Discuss histogram equalisation. **[5]**

P.T.O.

Q4) Attempt the following :

- a) Explain in details Elements of Visual Perception. [7]
- b) Write a short note on image restoration. [5]

Q5) Attempt the following :

- a) Explain various Fields that are used in Digital Image Processing. [7]
- b) Explain Periodic Noise Reduction by Frequency Domain Filtering. [5]

Q6) Attempt the following :

- a) What is edge detection? Explain edge detection technique of Segmentation. [7]
- b) Explain Discrete Fourier Transform (DFT). [5]

Q7) Write short notes on any two of the following : [12]

- a) Gamma-Ray Imaging.
- b) Regional Descriptors.
- c) X-Ray Imaging.



Total No. of Questions : 5]

SEAT No. :

PC-5010

[Total No. of Pages : 2

[6349]-506

T.Y.M.Sc.

Industrial Mathematics With Computer Applications

MIM-507: INTERNET OF THINGS

(2019 Pattern) (Semester - V)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any THREE questions from 2 to 5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn whenever necessary.*

Q1) Attempt any FIVE of the following :

[5]

- a) Give any 2 uses of Sensor.
- b) What are Sensor nodes?
- c) What is clustering?
- d) What is use of Satellite technology?
- e) What do you mean by Scalability?
- f) Define the term M2M Communication.
- g) Mention any 2 key IoT technologies.

Q2) Attempt the following questions:

- a) Explain applications of IoT in e-Health. **[5]**
- b) Explain WSN architecture. **[5]**

P.T.O.

Q3) Attempt the following questions:

- a) List the Advantages of IoT. [5]
- b) Explain the Advantages and Disadvantages of RFID. [5]

Q4) Attempt the following questions:

- a) Explain application of IoT in agriculture field. [5]
- b) What is wireless communication? Explain its role in IoT? [5]

Q5) Attempt the following questions:

- a) Differentiate between EPC and RFID. [5]
- b) Explain 5 Layer Architecture of IoT with neat diagram. [5]



Total No. of Questions : 5]

SEAT No. :

PC-4403

[Total No. of Pages : 2

[6349]-1001

M.Sc. (Industrial Mathematics with Computer Applications)

IMT-501 MJ : Linear Algebra

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q1 is compulsory.*
- 2) *Attempt any THREE questions from 2 to 5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non- programmable scientific calculators is allowed.*

Q1) Attempt any Five of the following :

[5 × 1 = 5]

- a) Find the number of parameters in the general solution of $AX = 0$ if A is a matrix 5×7 of rank 3.
- b) Let W be the set of 2×2 matrices with determinant zero. Is W a subspace of M_2 Justify.
- c) Show that a square matrix A is invertible if all its eigenvalues are nonzero.
- d) What is the dimension of the vector space of all symmetric $n \times n$ matrices?
- e) If u and v are orthogonal vectors in an inner product space, then prove that $\|u+v\|^2 = \|u\|^2 + \|v\|^2$
- f) Show that $X = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ is an eigen vector of $A = \begin{bmatrix} 3 & 0 \\ 8 & -1 \end{bmatrix}$ corresponding the eigen value to $\lambda = 3$.
- g) Let $u = (2, -1, 3)$ and $a = (4, -1, 2)$. Find the vector component of u along a and the vector complement of u orthogonal to a.

Q2) a) Find basis for row space and basis for nullspace of the following matrix.

Mention the rank and nullity. $A = \begin{bmatrix} 0 & 0 & 1 & 2 \\ 0 & 0 & 1 & 2 \\ 1 & 1 & 1 & 0 \end{bmatrix}$ **[5]**

P.T.O.

- b) Find the value of c that makes it possible to solve $Ax = b$, and solve it

$$u + v + 2w = 2$$

$$2u + 3v - w = 5$$

$$3u + 4v + w = c.$$

[5]

- Q3) a)** Find the eigen values of $A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 4 & -17 & 8 \end{bmatrix}$. [5]

- b) Do the vectors $p_1 = 1 - 3x + 2x^2$, $p_2 = 1 + x + 4x^2$, $p_3 = 1 - 7x$ span p_2 ? Justify. [5]

- Q4) a)** Which pairs are orthogonal among the vectors V_1, V_2, V_3, V_4 [5]

$$V_1 = \begin{bmatrix} 1 \\ 2 \\ -2 \\ 1 \end{bmatrix}, V_2 = \begin{bmatrix} 4 \\ 0 \\ 4 \\ 0 \end{bmatrix}, V_3 = \begin{bmatrix} 1 \\ -1 \\ -1 \\ -1 \end{bmatrix}, V_4 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

- b) Let \mathbb{R}^3 have the Euclidean inner product use the Gram Schmidt process to transform the basis $(1, -1, 0)$, $(0, 1, -1)$, and $(1, 0, -1)$ to an orthonormal basis. [5]

- Q5) a)** Find matrix P that diagonalizes $A = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$ [5]

- b) Decide for or against the positive definiteness of $A = \begin{bmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{bmatrix}$ [5]



Total No. of Questions : 7]

SEAT No. :

PC-4404

[Total No. of Pages : 3

[6349]-1002

M.Sc. (Industrial Mathematics With Computer Applications)
IMT-503 MJ: DISCRETE MATHEMATICAL STRUCTURE
(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Attempt any Five questions from Q.2 to Q.7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Solve any five of the following.

[10]

- a) Show that $p \vee q$ and $\sim p \rightarrow q$ are logically equivalent.
- b) State true or false: Maximum number of edges in a connected graph with 18 vertices are 153. Justify.
- c) Draw a graph which is neither Hamiltonian nor Eulerian.
- d) Show that the distributive law $x(y + z) = xy + xz$ is valid using Boolean function tables.
- e) How many arrangements of the word "MARATHI" are there?
- f) Is K_5 planar? Explain.
- g) Find the first four terms of the recurrence relation :

$$a_n = a_{n-1} + 3a_{n-2} \text{ with } a_0 = 1, a_1 = 2.$$

Q2) Attempt the following

- a) Find a recurrence relation and give initial conditions for the number of bit strings of length n that do not have two consecutive os. How many such bit strings are there of length five? **[7]**
- b) Construct a truth table for $(p \leftrightarrow q) \vee (\sim p \leftrightarrow q)$. State whether it is Tautology or Contingency. **[5]**

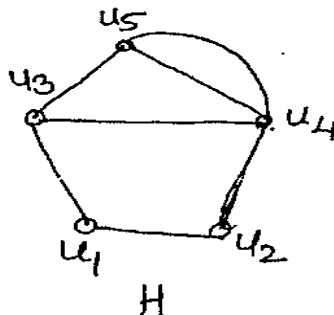
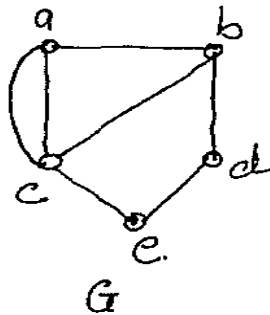
P.T.O.

Q3) Attempt the following.

- Show that if n is an integer greater than 1, then n can be written as the product of primes. [7]
- Find sequence of Fibonacci numbers and then an explicit recurrence formula for the Fibonacci numbers. [5]

Q4) Attempt the following.

- Write the following argument in symbolic form and test the validity by indirect method. If Ravi knows Pascal, then he passes the examination. Ravi knows Java. If Ravi Knows Java, then he is selected for campus interview or he does not pass the examination. he is not selected for campus interview. Therefore, Ravi does not know Pascal. (p,q,r,s) [7]
- Determine whether the graphs $G = (V, E)$ and $H = (W, F)$ shown below are isomorphic [5]



Q5) Attempt the following.

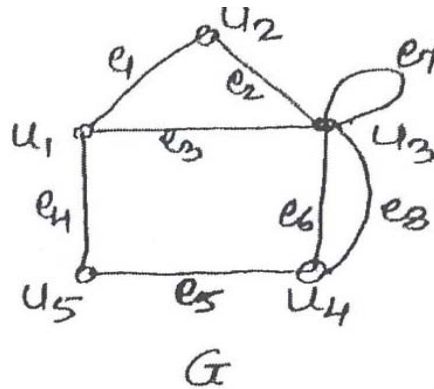
- Find the solution to the recurrence relation $a_n = 2a_{n-1} + 3^n$, $a_1 = 5$. [7]
- What is the coefficient of $x^{12} y^{13}$ in the expansion of $(2x - 3y)^{25}$? [5]

Q6) Attempt the following.

- Find the values of the Boolean function represented by $F(x, y, z) = x(yz + \overline{y}\overline{z})$ and also write their disjunctive normal form. [7]
- How many bit strings of length eight either start with a 1 bit or end with the two bits 00? [5]

Q7) Attempt the following.

- a) Use mathematical induction to show that $1 + 2 + 2^2 + 2^3 + \dots + 2^n = 2^{n+1} - 1$ for all non-negative integers n . [6]
- b) Write the adjacency matrix and incidence matrix for the following graph G . [6]



Total No. of Questions : 5]

SEAT No. :

PC-4405

[Total No. of Pages : 2

[6349] - 1003

M.Sc.

(Industrial Mathematics with Computer Applications)

IMT-504 MJ: Object Oriented Programming Using C++

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q1 is compulsory.*
- 2) *Attempt any THREE questions from 2 to 5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Attempt any FIVE of the following :

[5]

- a) What is Pointer?
- b) List different types of constructor in CPP.
- c) What is stream?
- d) Who do you create Object in CPP?
- e) Define data member and member function.
- f) Write syntax of do...While loop.
- g) What is Expression?

Q2) a) Write a program to find addition of two numbers of different types using function overloading. **[5]**

b) Differentiate between object oriented programming and procedure oriented programming. **[5]**

P.T.O.

- Q3)** a) What is friend function? Explain its characteristics. [5]
- b) Explain different scope of variables with example [5]
- Q4)** a) Explain different looping statements with example. [5]
- b) Explain user define function in details (declaration, definition and calling) [5]
- Q5)** a) Write a C++ program to subtract two matrices. [5]
- b) Explain ifstream, ofstream classes in CPP. [5]



Total No. of Questions : 5]

SEAT No. :

PC-4406

[Total No. of Pages : 2

[6349]-1004

M.Sc. (Industrial Mathematics with Computer Applications)

IMT-505 MJ: DATA BASE MANAGEMENT SYSTEM

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any Three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Draw the diagrams wherever necessary.*

Q1) Attempt Any Five of the following:

[5 × 1 = 5]

- a) List data types in PL/PGSQL
- b) Define Unique Key.
- c) Enlist DDL commands.
- d) Give any two applications of NoSQL.
- e) Define View.
- f) Enlist types of constraints.
- g) List the types of Attributes.

Q2) Attempt the following:

[2 × 5 = 10]

- a) What stands for DBA ? Explain the Role of DBA.
- b) What are the types of NoSQL Databases.

P.T.O.

Q3) Attempt the following:

[2 × 5 = 10]

- a) What is DML? Explain DML commands with example.
- b) Explain For loop in PL/PGSQL.

Q4) Attempt the following:

[2 × 5 = 10]

- a) What is Intersection operation in Relational Algebra? Explain with example.
- b) What are the aggregate functions ? Explain with examples.

Q5) Attempt the following:

[2 × 5 = 10]

- a) Consider the following database.
Students (rollno, name, percent)
 - Write a cursor to display names of students who have scored ≥ 60 percent.
- b) What is mean by Nested Queries? Explain with example.



Total No. of Questions : 5]

SEAT No. :

PC-4407

[Total No. of Pages : 2

[6349]-1005

F.Y. M.Sc. (Industrial Mathematics with Computer Applications)

IMT - 510 (A) MJ : STATISTICAL METHODS

(2023 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any Three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculator is allowed.*

Q1) Attempt Any Five of the following:

[5 × 1 = 5]

- a) State any two applications of statistics in the computer field.
- b) List the sources of secondary data.
- c) Identify the type correlation between two variables for the following :
 - i) Sale of ice cream and day temperature
 - ii) Supply and price of commodities.
- d) State the normal equations for fitting a second degree curve of type $Y = a + b X + c X^2$.
- e) Define median as a measure of central tendency.
- f) For a bivariate data the least square lines of regression are $3x - y = 5$ and $4x - 3y = 0$. Obtain means of X and Y.
- g) State the probability mass function of Geometric distribution.

P.T.O.

Q2) Attempt each of the following:

[2 × 5 = 10]

- a) Define Arithmetic mean. Explain why it is called a good measure of central tendency.
- b) Differentiate between the Census method and sampling method of data collection.

Q3) Attempt each of the following:

[2 × 5 = 10]

- a) What is skewness? Explain the different types of skewness with sketches.
- b) Define scatter diagram. Explain different categories of scatter diagrams with sketches.

Q4) Attempt each of the following:

[2 × 5 = 10]

- a) Explain the concept of multiple correlation coefficient. Also state the equation of multiple correlation coefficient of X_2 on X_1 and X_3 and explain its significance in the multiple regression model.
- b) The following table gives the sales (X) in thousand rupees and expenses (Y) in thousand rupees of 10 firms:

| | | | | | | | | | | |
|---|----|----|----|----|----|----|----|----|----|----|
| X | 45 | 70 | 65 | 30 | 90 | 40 | 50 | 75 | 85 | 60 |
| Y | 53 | 90 | 70 | 40 | 95 | 40 | 60 | 80 | 80 | 50 |

Q5) Attempt each of the following:

[2 × 5 = 10]

- a) Define Binomial distribution. State its mean and variance. Also discuss its real life situations.
- b) Intelligent Quotient (I.Q.) of adults is normally distributed with mean 100 and standard deviation 20. If an adult is selected at random, find the probability that his I.Q.
 - i) is less than 120.
 - ii) lies between 80 and 120



Total No. of Questions : 5]

SEAT No. :

PC-4408

[Total No. of Pages : 2

[6349]-1006

M.Sc. (Industrial Mathematics With Computer Applications)

IMT-510 (B) MJ : NUMERICAL ANALYSIS

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Attempt any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Solve any five of the following.

[5]

- a) Construct backward difference table for the following data.

| | | | | | | |
|-----|--------|---------|---------|---------|---------|---------|
| x | 0 - 40 | 40 - 45 | 45 - 50 | 50 - 55 | 55 - 60 | 60 - 65 |
| y | 210 | 43 | 54 | 74 | 32 | 73 |

- b) If the number $\frac{4}{3}$ is represented approximately as 1.3333, find the absolute error and relative error.

- c) Find fixed point if any of $g(x) = -4 + 4x - \frac{x^2}{2}$

- d) Show that : $\nabla = E \nabla$

- e) Find the Jacobian matrix $J(x, y)$ at the point (1,2) for the functions,

$$f_1(x, y) = x^3 y^2 - 5x^2 y^2$$

$$f_2(x, y) = y^6 - 3y^3 x + 7$$

- f) State the formula for Simpson's (1/3)rd rule.

- g) Find an interval $[a, b]$ such that the real root of the equation $xe^x = 1$ lies in $[a, b]$.

P.T.O.

Q2) a) Use Euler's method to solve $\frac{dy}{dx} = y^2 + 1, y(0) = 0$. Obtain $y(0.1), y(0.2)$ and $y(0.3)$. (Take $h = 0.1$) [5]

b) Assume that $g \in C[a,b]$. The range of the mapping $y = g(x)$ satisfies $a \leq y \leq b$ for all $a \leq x \leq b$ then prove that g has a fixed point in $[a,b]$. [5]

Q3) a) Show that matrix $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & 0 \\ 2 & -4 & 2 \end{bmatrix}$ is diagonalizable. [5]

b) Apply Runge Kutta method of order 2 to find a solution to the initial value problem $y' = x^2 + y$ with $y(0) = 1$ at $x = 0.2$ and $x = 0.4$ (Take $h = 0.2$). [5]

Q4) a) Use Gauss Seidel iterative method to solve the system. [7]

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

$$-2x - 6y + z = 9$$

$$-x + y + 7z = -6$$

(Perform 4 iterations)

b) Find the parabola $y = A + Bx + Cx^2$ that passes through the point $(1, 1), (2, -1), (3, 1)$. [5]

Q5) a) Explain Aitken's interpolation method for unequally spaced value of variable x . [5]

b) Solve $LY = B, UX=Y$ and verify that $AX = B$ for $B^T = (9, 6, 8)$ and $A = LU$ where, [5]

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}; \quad L = \begin{bmatrix} 1 & 0 & 0 \\ 1/2 & 1 & 0 \\ 3/2 & -7 & 1 \end{bmatrix}; \quad U = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 1/2 & 5/2 \\ 0 & 0 & 18 \end{bmatrix}$$



Total No. of Questions : 5]

SEAT No. :

PC-4409

[Total No. of Pages : 2

[6349]-1008

M.Sc. (Industrial Mathematics With Computer Applications)

IMT-507RM : RESEARCH METHODOLOGY

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q1 is compulsory.*
- 2) *Attempt any THREE questions from 2 to 5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non- programmable scientific calculators is allowed.*

Q1) Multiple Choice Questions.

[5]

- a) What is the name of the process of selecting a subset of individuals from a population to participate in a study?
 - i) Sampling
 - ii) Partitioning
 - iii) Grouping
 - iv) Dividing
- b) What is the main difference between qualitative and quantitative research methods?
 - i) Qualitative methods use words, while quantitative methods use numbers
 - ii) Qualitative methods are subjective, while quantitative methods are Objective
 - iii) Qualitative methods are exploratory, while quantitative methods are confirmatory
 - iv) All of the above
- c) What is the name of the research methods that involves testing a hypothesis by manipulating one or more independent variables and measuring their effect on one or more dependent variables?
 - i) Experimental method
 - ii) Survey method
 - iii) Historical method
 - iv) Ex- post facto method

P.T.O.

- d) What is the name of the document that presents the research objectives, design and expected outcomes of a study?
 - i) Research proposal ii) Research report
 - iii) Research synopsis iv) Research abstract
- e) What is the purpose of a literature review in the research process?
 - i) To present the research findings
 - ii) To summarize the research methodology
 - iii) To identify and analyze existing research on the topic
 - iv) To propose a new research topic

Q2) a) Define Research Objectives and Questions. [5]
 b) Define Primary and Secondary Sources of Data Collection [5]

Q3) a) Write a note on Types of Research . [5]
 b) Write a note on paraphrasing Software. [5]

Q4) a) Write a note on Plagiarism and software to detect plagiarism. [5]
 b) Define Components of Research Proposal. [5]

Q5) a) Define Data Analysis and Interpretation. [5]
 b) Write a note on Ethical Issues in Research. [5]



Total No. of Questions : 7]

SEAT No. :

PC-4410

[Total No. of Pages : 2

[6349]-2001

M.Sc. (Industrial Mathematics with Computer Application)

IMT-551MJ : FOUNDATION OF ANALYSIS

(2023 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question 1 is compulsory.*
- 2) *Attempt only five questions from Q2 to Q7.*
- 3) *Figure to the right indicate full marks.*
- 4) *Use of non-Programmable scientific calculators is allowed.*

Q1) Solve any FIVE from the following :

[10]

- a) Find Radius of convergence of series $\sum_{n=1}^{\infty} n^n z^n$.
- b) Find limsup and liminf of the sequence $S_n = \left\{ \frac{2n}{3n+5} \right\}$.
- c) Define
 - i) Limit point
 - ii) Dense set
- d) Show that the series $\sum_{n=1}^{\infty} \left(\frac{6n+1}{2n+1} \right)$ is divergent.
- e) With example show that, In Collection $\{F_\alpha\}$ of closed sets, $\bigcup_\alpha F_\alpha$ is not an closed set.
- f) Define Weierstrass M-test.
- g) Find $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$.

P.T.O.

- Q2)** a) i) Prove that for any Collection $\{G_\alpha\}$ of open sets $\bigcup_\alpha G_\alpha$ is open set.
 ii) For any collection $\{F_\alpha\}$ of closed sets $\bigcap_\alpha F_\alpha$ is closed.

[7]

- b) Prove that (X, d) is a metric space if $X = (0, \infty)$ and $d(x, y) = \left| \frac{1}{x} - \frac{1}{y} \right|$.

[5]

- Q3)** a) A Set E is Open if and only if its complement is closed. [7]

- b) Prove that if $0 \leq x < 1$ then $\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$. [5]

- Q4)** a) Find the region of convergence for the series $\sum_{n=1}^{\infty} \frac{5^n (x-2)^n}{n}$. [7]

- b) Define Root test and using Root test show that $\sum_{n=1}^{\infty} \left(\frac{3n+1}{4-2n} \right)^n$ is divergent.

[5]

- Q5)** a) A subset E of the line \mathbb{R}^1 is connected if and only if it has the following property [7]

If $x \in E$, $y \in E$ and $x < z < y$ then $z \in E$.

- b) By Using $\varepsilon - \delta$ definition of limit prove that $\lim_{n \rightarrow 3} x^2 - x = 6$. [5]

- Q6)** a) State and prove fundamental theorem of Calculus. [7]

- b) Show that a constant function k is Riemann integrable on $[a, b]$ and $\int_a^b k dx = k(b-a)$. [5]

- Q7)** a) Prove that closed subsets of compact sets are compact. [6]

- b) Prove that $\sum_{n=1}^{\infty} \frac{x}{n(1+nx)}$ is uniformly convergent on $[1, \infty)$. [6]



Total No. of Questions : 7]

SEAT No. :

PC-4411

[Total No. of Pages : 2

[6349]-2002

M.Sc. (Industrial Mathematics With Computer Application)

IMT-552MJ : APPLIED ALGEBRA

(2023 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question 1 is compulsory.*
- 2) *Attempt only five questions from Q2 to Q7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-Programmable scientific calculators is allowed.*

Q1) Solve any FIVE from the following :

[10]

- a) Define cyclic group and give an example of a finite non cyclic group.
- b) Prove that in a group G , there is a unique element b in G such that $ab=ba=e$.
- c) Write all subgroups of Klein-4 group.
- d) If ϕ is an isomorphism from group G to \bar{G} then show that ϕ carries the identity of G to the identity of \bar{G} .
- e) Define greatest common divisor with example.
- f) Find $\phi(25)$
- g) State Division algorithm for divisibility of integers.

Q2) a) The center of a group $Z(G)$ is a subgroup of G .

[7]

b) Find the inverse of the element $\begin{bmatrix} 2 & 6 \\ 3 & 5 \end{bmatrix}$ in $GL(2, Z_{11})$.

[5]

P.T.O.

- Q3)** a) Show that every group is isomorphic to a group of permutations. [7]
 b) Prove that if $(ab)^2 = a^2b^2$ in a group G , then $ab = ba$. [5]

- Q4)** a) Show that the group of real numbers G under addition and the group of positive real numbers \bar{G} under multiplication are isomorphic. [7]
 b) What is the order of each of the following permutations? [5]

i)
$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 1 & 5 & 4 & 6 & 3 \end{bmatrix}$$

ii)
$$\begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 7 & 6 & 1 & 2 & 3 & 4 & 5 \end{bmatrix}$$

- Q5)** a) Show that the integers 389 and 167 are relatively prime. Find integers x and y such that $389x + 167y = 1$. [7]
 b) By using mathematical induction, show that [5]

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}.$$

- Q6)** a) A word has been broken into blocks of two letters and converted to two digit numbers using the correspondance
 $G = 1, R = 2, A = 3, D = 4, U = 5, O = 6, S = 7, I = 8, T = 9, Y = 0$
 Then blocks are then encoded using the public key code with base 123 and exponent 27. The coded message is 10/04. Find the word which was coded. [7]
 b) Find remainder of 7^{486} when divided by 13. [5]

- Q7)** a) Solve the congruence [6]
 $6x \equiv 5 \pmod{17}$
 b) Find the inverse of 23 modulo 73 using Euclidean algorithm. [6]



Total No. of Questions : 5]

SEAT No. :

PC-4412

[Total No. of Pages : 2

[6349]-2003

M.Sc. (Industrial Mathematics With Computer Applications)

IMT-553 MJ: DATA STRUCTURE

(2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Attempt any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Attempt any five of the following.

[5×1=5]

- a) Give any two example of nonlinear Data structure.
- b) Give any two sorting method.
- c) Explain node structue of Circular Linked List.
- d) Write is Empty() function in a stack.
- e) What is skewed tree?
- f) Define Priority Queue.
- g) Which tree is balance tree?

Q2) a) Write a short note on: Merge Sort.

[5]

- b) Construct Binary search Tree for following data. Show the tree at each step.

34, 91, 30, 31, 80, 85, 138

[5]

Q3) a) Explain Inorder, Preorder and Postorder traversal of binary tree.

[5]

- b) Evaluate the following Prefix expression using stack and also give the content of stack. $*+AB-CD$ Where $A = 5$ $B = 4$ $C = 6$ $D = 2$

[5]

P.T.O.

- Q4)** a) Sort the following elements by using heap sort. Show all intermediate Steps. 26, 5, 77, 1, 61, 11, 59, 18 [5]
- b) Write the following function in queue. [5]
init(), enqueue(), dequeue(), isEmpty(), isFull()
- Q5)** a) Write a short note on FCFS CPU scheduling algorithm. [5]
- b) Explain with example Sequential search method. [5]



Total No. of Questions : 5]

SEAT No. :

PC-4413

[Total No. of Pages : 2

[6349]-2004

M.Sc. (Industrial Mathematics with Computer Applications)

IMT-560(A) MJ: WEB TECHNOLOGY

(2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any Three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Attempt Any Five of the following:

[5 × 1 = 5]

- a) Why is HTTP designed to be stateless?
- b) What is Express JS?
- c) What is the difference between res.send() and res.json() in Express.js?
- d) How is Express.js different from Node.js?
- e) Define MongoDB.
- f) What is a web server?
- g) How to define an Object in JavaScript?

Q2) a) Create a HTMLS script that incorporates headings, paragraphs, links, and the rendering of images on the page. [5]

b) Write a HTMLS script for student registration form. [5]

P.T.O.

- Q3)** a) What is a Java Script? What are data types supported by Java Script? explain any four of them. [5]
b) Explain Java Script promises with an suitable example. [5]
- Q4)** a) What is a module in NodeJS and explain the HTTP module with an example. [5]
b) Describe Synchronous and Asynchronous approach of handling file in node JS. [5]
- Q5)** a) Describe any five features of Express JS? [5]
b) Explain the steps to connect to mongodb database using node js. [5]



Total No. of Questions : 7]

SEAT No. :

PC- 4414

[Total No. of Pages : 2

[6349]-3001

M.Sc. (Industrial Mathematics With Computer Applications)
IMT - 601 MJ : ORDINARY DIFFERENTIAL EQUATIONS
(2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any Five questions from 2 to 7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Solve any Five from the following.

[10]

- a) Check whether the differential equation is exact or not
$$e^x dx + (e^y (y + 1)) dy = 0.$$
- b) Solve $y' = x^2 y^2 + 4x^2$.
- c) Show that the function $f(x, y) = 4x^2 + y^2$ satisfies Lipschitz condition on $|x| \leq 1, |y| \leq 1$.
- d) Verify the function $\phi(x) = c_1 + c_2 e^x$ is the solution of the differential equation $y'' - y' = 0$, where c_1, c_2 are the constants.
- e) Find singular points and determine those which are regular singular points
 $x^2 y'' + (\sin x) y' + (\cos x) y = 0.$
- f) Determine whether the functions $\phi_1(x) = x^2, \phi_2(x) = 5x^2$ are linearly dependent or independent.
- g) Find all solutions of the differential equation $y'' + 16y = 0$.

Q2) a) Solve the differential equation $y'' + 9y = \sin 3x$.

[7]

b) Solve the differential equation $y^{(4)} + 16y = 0$.

[5]

- Q3) a)** Find the solutions of $y'' - \frac{2}{x^2}y = x$ if $\phi_1(x) = x^2, \phi_2(x) = \frac{1}{x}$ are the solutions of corresponding homogenous differential equation $y'' - \frac{2}{x^2}y = 0$. [7]
- b)** Compute the indicial polynomial and their roots for the differential equation $x^2y'' + (x + x^2)y' - y = 0$. [5]
- Q4) a)** If ϕ_1, ϕ_2 are two solutions of $y'' + a_1y' + a_2y = 0$ on an interval I containing a point x_0 then $W(\phi_1, \phi_2)(x) = e^{-a_1(x-x_0)} W(\phi_1, \phi_2)(x_0)$. [7]
- b)** Find all solutions of the differential equations for $x > 0$, $x^2y'' - 3xy' + 5y = 0$. [5]
- Q5) a)** If one solution of $y'' - 4xy' + (4x^2 - 2)y = 0$ is $\phi_1(x) = e^{\frac{x}{2}}$ then find the another solution by method of reduction of order. [7]
- b)** Solve the initial value problem $y'' + 2y' + 5y = 0, y(0) = 2, y'(0) = 0$. [5]
- Q6) a)** Solve the non-homogenous differential equation $y'' - y = \operatorname{cosec} x$. [7]
- b)** Solve $(y^4 - 2x^3y)dx + (x^4 - 2xy^3)dy = 0$. [5]
- Q7) a)** Find two linearly independent power series solutions of the differential equation $y'' - x^2y = 0$. [6]
- b)** Solve $(3x + 2)^2y'' + 3(3x + 2)y' - 36y = 0$. [6]



Total No. of Questions : 5]

SEAT No. :

PC-4415

[Total No. of Pages : 2

[6349]-3002

S.Y. M.Sc.

**INDUSTRIAL MATHEMATICS WITH COMPUTER
APPLICATIONS**

**IMT - 602 MJ : Computer Networks
(2023 Pattern) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any Three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Attempt Any Five of the following:

[5 × 1 = 5]

- a) What is Multiplexing in Bandwidth Utilization.
- b) Which is two Types of Cryptography.
- c) What is SMTP?
- d) What is Congestion Control?
- e) Differentiate between Virtual Circuits and Datagram Subnets
- f) Write working of Point-to-Point Protocol (PPP).
- g) Define Half Duplex and Full Duplex.

Q2) a) Write a note on Traditional Ciphers.

[5]

b) Explain in details Subnetting.

[5]

P.T.O.

- Q3)** a) Write a note on IPV4 protocol. [5]
b) Explain in details unguided media. [5]
- Q4)** a) Explain any two Layers of OSI reference model. [5]
b) Differentiate between LAN and WAN. [5]
- Q5)** a) Write a short note on TCP and UDP. [5]
b) Explain point -to-point, bus, ring and star topology. [5]



Total No. of Questions : 7]

SEAT No. :

PC-4416

[Total No. of Pages : 2

[6349]-3003

S.Y. M.Sc.

(Industrial Mathematics With Computer Applications)

**IMJ-603 MJ : DESIGN AND ANALYSIS OF ALGORITHM
(2023 Pattern) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q2 to Q7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-Programmable scientific calculators is allowed.*

Q1) Solve any FIVE from the following :

[5 × 2 = 10]

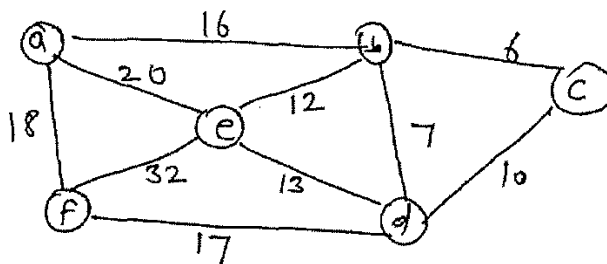
- a) Show that $3n^2 + 4 = O(n^2)$.
- b) Give time complexity of quick sort in worst case and average case.
- c) Define big O notation.
- d) Write a statement of Strassen's Matrix multiplication problem.
- e) What is an Algorithm?
- f) Write a note on greedy strategy.
- g) Explain "NP completeness".

Q2) a) Explain divide-and-conquer approach with example.

[7]

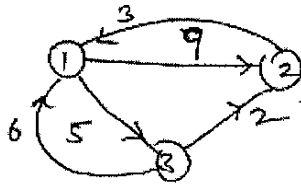
b) Using Prim's algorithm find minimum spanning tree for following graph.

[5]



P.T.O.

- Q3) a)** Apply Floyd-Warshall's algorithm to find shortest path between every pair of vertices for the following graph. [7]

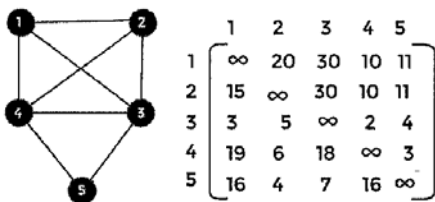


- b) Apply merge sort to sort following Set {30, 192, 41, 38, 30, 58, 90, 6, 42}. [5]

- Q4) a)** Write a short note on n-queens problem. [7]
b) Write a short note on Topological sorting. [5]

- Q5) a)** Explain Depth first search algorithm. [7]
b) Determine longest common subsequences for [5]
 $X = (A, B, A, C, B, D, D)$ and $Y = (B, A, A, C, B, D, A)$.

- Q6) a)** Traveling Salesman problem using LCBB method (variable tuple size). Given graph and adjacency matrix of the problem is given below: [7]



- b) Write a short note on Cook's theorem. [5]

- Q7) a)** Solve knapsack problem using Merge & Purge method instance $M = 8$ and $n = 4$. Let p_i and w_i are as shown below. [7]

| i | p_i | w_i |
|---|-------|-------|
| 1 | 1 | 2 |
| 2 | 2 | 3 |
| 3 | 5 | 4 |
| 4 | 6 | 5 |

- b) Explain with example Binary search. [5]



Total No. of Questions : 5]

SEAT No. :

PC-4417

[Total No. of Pages : 2

[6349]-3005

S.Y.M.Sc. (Industrial Mathematics with Computer Applications)

IMT-611(B) MJ: DOTNET PROGRAMMING

(2023 Pattern) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Attempt any three questions from Q.2 to Q.5.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of non-programmable scientific calculators is allowed.*

Q1) Attempt any five of the following :

[5 × 1 = 5]

- a) Define Class and Object.
- b) List the types of delegates in C#.
- c) What is GAC?
- d) Explain the use of foreach loop in C#.
- e) Write any two advantages of inheritance.
- f) Explain Random Access File.
- g) What is boxing and unboxing in C#.

Q2) a) What are different types of collections in C#? Explain.

[5]

b) Define Assembly. What are the features of assembly?

[5]

Q3) a) Write a short note on Accessing Data with ADO.NET.

[5]

b) Explain the .NET Framework Architecture with block diagram.

[5]

P.T.O.

- Q4)** a) Define Array. Explain one dimensional array with example. [5]
b) What is exception handling? Explain it with example. [5]
- Q5)** a) Write a program in C# to sort the number in descending order. [5]
b) Write a program in C# to check whether given year is leap year or not.[5]

