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BCA (Sem. - 1st)
MATHEMATICS (Bridge Course)
SUBJECT CODE : BC - 102(N2)
Paper ID : [B0202]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.

Section - A

Q1)

(10 × 2 = 20)

- a) Define finite set with an example.
- b) What is complement of a set?
- c) What is Relation?
- d) Define even function with an example.
- e) State Binomial theorem.
- f) Explain Nilpotent Matrix.
- g) If $\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$
Find x,y,z and w.
- h) Define median.
- i) What is Quartile Deviation (Q.D).
- j) Find the value of $\tan 330^\circ$.

Section - B

(4 × 10 = 40)

Q2) Use the principle of mathematical induction to prove

$$1.2 + 2.3 + 3.4 + \dots + n(n+1) = \frac{1}{3} (n)(n+1)(n+2) \text{ for all } n \in \mathbb{N}.$$

Q3) If $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & 1 \\ 1 & -2 & 3 \end{bmatrix}$, find A^{-1} .

Q4) Prove that $\tan 70^\circ = \tan 20^\circ + 2 \tan 50^\circ$.

Q5) State and prove De Morgan's Laws.

Q6) Find the mean Deviation from the mean

x : 2 5 6 8 10 12

f : 2 8 10 7 8 5

Q7) Find the Domain and Range of the function

$$f(x) = \frac{x+1}{2x+1}.$$



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BCA (Sem. - 4th)

MATHEMATICS - II

(Computer Oriented Methods)

SUBJECT CODE : BC - 301 (Batch 2k3 Onwards)

Paper ID : [B0227]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is Compulsory.
- 2) Attempt any Four questions from Section - B.

Section - A

Q1)

(10 × 2 = 20)

- a) If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, Find the constant K so that $A^2 = KA - 2I$.
- b) If $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$, then verify that $(AB)^T = B^T A^T$, where T stands transpose of matrix.
- c) Find the adjoint of the matrix $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$.
- d) Find the mean of First n natural numbers.
- e) What is standard deviation? Explain its superiority over other measures of dispersion.
- f) Differentiate $\frac{e^x}{1 + \cos x}$ w.r.t x.
- g) Integrate $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^3$ w.r.t x.
- h) Evaluate $\int_0^{\pi/2} \cos^2 x \, dx$.

- i) Evaluate $\int_0^2 f(x)dx$, by Simpson's $\frac{1}{3}$ rd rule, whereas it is given that
- | | | | | | | |
|--------|---|---|------|---|------|---|
| x | : | 0 | 0.5 | 1 | 1.5 | 2 |
| $f(x)$ | : | 0 | 0.25 | 1 | 2.25 | 4 |
- j) Differentiate $(\sin x)^x$ w.r.t x .

Section - B

(4 × 10 = 40)

- Q2)** (a) Find the rank of the matrix

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

- (b) Obtain the inverse of the matrix

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

- Q3)** (a) Use Gauss elimination method to solve the system of equations :
 $x + 4y - z = -5$; $x + y - 6z = -12$; $3x - y - z = 4$.

- (b) Use matrix inversion method to solve the system of equations :
 $3x - 2y + 3z = 8$; $2x + y - z = 1$; $4x - 3y + 2z = 4$.

- Q4)** (a) Calculate the mean and standard deviation for the following table giving the age distribution of 542 members :

Age in years :	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of members :	3	61	132	153	140	51	2

- (b) For a distribution, the mean is 10, variance is 16, γ_1 is +1 and β_1 is 4. Obtain the first four moments about the origin. Comment upon the nature of distribution.

- Q5)** (a) Differentiate the following functions w.r.t x

(i) $\tan^{-1} \left(\frac{\sqrt{1+x^2}-1}{x} \right)$

(ii) $\sqrt{\frac{\sec x - 1}{\sec x + 1}}$

- (b) Find the points of local maxima and local minima if any of $f(x) = (x-1)(x+2)^2$.

Q6) (a) Evaluate the Integrals :

(i) $\int \frac{17x-2}{4x^2+7x-2} dx$.

(ii) $\int \log x dx$.

- (b) Evaluate : $\int_0^{\pi/2} \log \sin x dx$.

Q7) (a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ by using

(i) Trapezoidal rule.

(ii) Simpson's $\frac{3}{8}$ th rule.

(b) Explain the following terms :

(i) Coefficient of variation.

(ii) Kurtosis.



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BCA (Sem. - 2nd)
MATHEMATICS - I
(Discrete Mathematics)
SUBJECT CODE : BC - 203
Paper ID : [B0207]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.

Section - A

Q1)

(10 × 2 = 20)

- a) Prove : If A is a subset of the null set ϕ , then $A = \phi$.
- b) Show that the following argument is not valid :
 S_1 : All students are lazy.
 S_2 : Nobody who is wealthy is a student.
 S : Lazy people are not wealthy.
- c) Let R be the relation on the set N of positive integers defined by the equation $x^2 + 2y = 100$. Find the domain of R.
- d) Construct the truth table of $\sim(\sim p \wedge q) \vee q$
- e) Define Quantifiers.
- f) Find the first five terms of a sequence $a_0, a_1, a_2, \dots, a_n, \dots$ satisfying the given recurrence relation and initial conditions
 $a_n = a_{n-1} + 5$ if $n \geq 1, a_0 = 5$
- g) Define multigraphs.
- h) Draw the graph G whose adjacency matrix A is

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

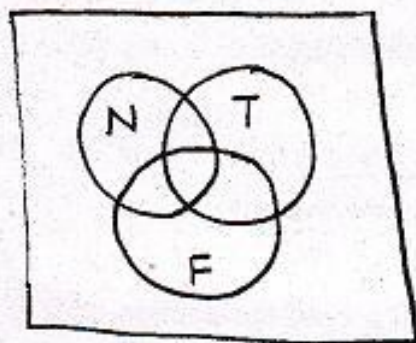
- i) Define the out degree and indegree of a vertex v .
- j) What do you mean by graph coloring?

Section - B

 $(4 \times 10 = 40)$

Q2) In a survey of 60 people, it was found that 25 read Newsweek magazine, 26 read Time, and 26 read Fortune. Also 9 read both Newsweek and Fortune, 11 read both Newsweek and Time, 8 read both Time and Fortune and 8 read no magazine at all.

- (a) Find the number of people who read all three magazines.
- (b) Fill in the correct number of people in each of the eight regions of the following venn diagram (Here N, T and F denote the set of people who read Newsweek, Time, and Fortune respectively).



- (c) Determine the number of people who read exactly one magazine.

Q3) (a) Prove $(A \cup B) \cap (A \cup B^c) = A$

(where B^c stands for complement of B)

- (b) Let $A = \{1, 2, 3, 4, 6\}$ and let R be the relation on A defined by "x divides y".
 - (i) Write R as a set of ordered pair.
 - (ii) Draw the directed graph of R.

Q4) (a) Show the equivalence of the following

$$[d \rightarrow ((\sim a) \wedge b) \wedge c] \text{ and } \sim [(a \vee (\sim (b \wedge c))) \wedge d]$$

- (b) Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = 2x - 3$.

- (i) Find f^{-1}
- (ii) Find the domain of f^{-1}