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1 SEM BCA (CBCS) MTH 2

2017

(December)

COMPUTER APPLICATION

Paper : 1-2

(**Mathematics - I**)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer question no. **1** and **any five** from the rest of the following :

1. Answer the following questions : $2 \times 5 = 10$

(a) Define set with example.

(b) What is universal quantifier?

(c) State De-Moivre's Theorem.

(d) Write *any two* properties of determinants.

(e) What is the difference between permutation and combination?

Contd.

2. Answer the following questions :

(a) Construct a truth table for the following proposition 5

$$\neg(p \vee q) \vee (\neg P \wedge \neg q).$$

(b) Without constructing the truth table show that 5

$$P \rightarrow (Q \rightarrow R) \equiv (P \wedge Q) \rightarrow R$$

3. Answer the following questions :

(a) If R be a relation on the set of integers z defined by

$$R = \{(x, y) : x \in z, y \in z, (x - y) \text{ is divisible by } 6\}$$

then prove that R is an equivalence relation. 6

(b) Show that the function $f: R^+ \rightarrow R$ defined as $y = \log x$ is a one-one function. 2

(c) Let $f: R \rightarrow R$ and $g: R \rightarrow R$ be two functions defined as $f(x) = x^2$ and $g(x) = 3x + 1$. Find $gof(x)$ and $fog(x)$ and find whether or not $gof(x) = fog(x)$. 2

4. Answer the following questions :

(a) Solve for θ such that the expression

$$\frac{3 + 2i \sin \theta}{1 - 2i \sin \theta} \text{ is imaginary. } 4$$

(b) If $\sin \alpha + \sin \beta + \sin \gamma = 0 = \cos \alpha + \cos \beta + \cos \gamma$ Prove that

$$\cos 2\alpha + \cos 2\beta + \cos 2\gamma = 0 = \sin 2\alpha + \sin 2\beta + \sin 2\gamma \quad 6$$

5. Answer the following questions :

(a) Without expanding the determinants prove that 4

$$\begin{vmatrix} \frac{1}{a} & a^2 & bc \\ \frac{1}{b} & b^2 & ca \\ \frac{1}{c} & c^2 & ab \end{vmatrix} = 0$$

$$(b) \text{ If } A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

find A^{-1} .

6. Answer the following questions :

(a) In how many ways can 5 students be arranged in a row from a set of 8 students, if 2 particular students always take the corner seats? 240 3

(b) A bag contains 3 white, 4 black and 5 red balls from which 4 balls are chosen at random. Find the probability that 2 white balls, 1 black ball and 1 red ball are chosen. 4

(c) Discuss the difference between mode and median. 3

7. Answer the following questions :

(a) Find the rank of the matrix 5

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 7 \\ 3 & 6 & 10 \end{bmatrix}$$

(b) Find the adjoint and inverse of the following matrix 5

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

8. Answer the following questions :

(a) How many strings of length 3 or less can be generated using the letters $\{a, b, c\}$ if repetition is allowed? 3

(b) In how many ways can 5 students arrange themselves in a circle? 2 ③

(c) Find the arithmetic mean for the following distribution 5

Class	0-10	10-20	20-30	30-40	40-50
Frequency	7	8	20	10	5

Handwritten calculations for the arithmetic mean:

$$\begin{aligned} \text{Mean} &= \frac{\sum f_i x_i}{\sum f_i} \\ &= \frac{7 \times 5 + 8 \times 15 + 20 \times 25 + 10 \times 35 + 5 \times 45}{7 + 8 + 20 + 10 + 5} \\ &= \frac{35 + 120 + 500 + 350 + 225}{50} \\ &= \frac{1150}{50} \\ &= 23 \end{aligned}$$