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Sr. No 311108

Dec-2023(Reappear)  
BCA 1st SEMESTER  
Mathematics (BCA-17-103)

Time: 3 Hours

Max. Marks:75

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.
  2. Answer any four questions from Part -B in detail.
  3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

Que.1(a) If  $A = \{a, b, c, d\}$ ,  $B = \{b, d, e, f\}$  and  $C = \{e, d, g, b\}$ , then find  $(A \cup B)$ ,  $(B \cap C)$  and  $(A - B)$ .

(b) Evaluate the determinant  $\begin{vmatrix} 5 & 10 \\ -2 & 4 \end{vmatrix}$ .

(c) If  $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ , then find  $2A+B$  and  $A-3B$ .

(d) Let  $A = \{1, 2, 3, \dots, 45\}$  and  $R$  be the relation "is square of" in  $A$ . Then write  $R$  as a subset of  $A \times A$ . Also find the domain and range of  $R$ .

(e) Evaluate  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ .

(f) Define continuity. Also give one example.

(g) Find the derivative of  $(3+7x)^{-5/3}$ .

(h) Differentiate the given w.r.t.  $x$ :  $e^{x(1+\log x)}$ .

(i) Evaluate  $\int \frac{x}{(x-3)} dx$ .

(j) Find the value of  $\int_0^5 e^{2x} dx$ . (1.5\*10 = 15)

PART-B

Que.2(a) In a group of 65 people, 40 like cricket, 10 like both cricket and tennis, ~~the~~ <sup>then</sup> find

(i) How many like tennis?

(ii) How many like tennis only and not cricket? (8)

(b) By using determinants, show that the three points  $(-1, -1)$ ,  $(5, 7)$  and  $(8, 11)$  are collinear. (7)

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Que.3(a) Given  $A = \{1,2,3\}$ , then determine which of the following relations on A are partial order relations:

(i)  $\{(1,1),(2,1),(2,2)(3,3)\}$

(ii)  $\{(1,1),(2,1),(2,2)(3,3),(2,3),(3,1)\}$ .

(8)

(b) For what value of k is the given function continuous at  $x=2$ ?

$$f(x) = \begin{cases} \frac{x^2-4}{x-2} & \text{if } x \neq 2 \\ k & \text{if } x = 2 \end{cases}$$

(7)

Que.4(a) If  $y = x + \sqrt{x^2 - 1}$ , then prove that  $(y-x)dy/dx - y = 0$ .

(8)

(b) Find  $dy/dx$  where  $y = \tan^{-1} \left( \frac{\cos x}{1+\sin x} \right)$ .

(7)

Que.5(a) Evaluate the given integral using reduction formula:  $\int x^4 e^{2x} dx$ .

(8)

(b) Evaluate  $\int_0^{\pi/2} x^2 \sin 3x dx$ .

(7)

Que.6(a) Solve the following system of linear equations by using Cramer's rule:

$$x - y + 3z = 6, \quad x + 3y - 3z = -4, \quad 5x + 3y + 3z = 10.$$

(8)

(b) In the set of integers, let a relation R be defined as  $aRb$  if and only if  $a-b$  is even. Then prove that R is an equivalence relation.

(7)

Que.7(a) Differentiate the given function w.r.t.  $x$ :  $(x+3)^2(x+4)^3(x+5)^4$ .

(8)

(b) Evaluate:  $\int \frac{dx}{5+7\cos x+\sin x}$ .

(7)

