Roll No. .... Total Pages : 4

204103

December, 2019
BCA I 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

1. (a) If $A = \{4, 5, 8, 12\}$, $B = \{1, 4, 6, 9\}$ and $C = (1, 2, 3, 4\}$, then find $A - (B - A)$ and $A - (C - B)$.

   (b) Write the given sets in roster form:

   (i) $A = \{x : x \text{ is an integer and } -3 < x < 7\}$.

   (ii) $B = \{x : x \text{ is a prime number which is divisor of } 60\}$.

(c) If $A = \{1, -1\}$, then find $A \times A \times A$.

(d) If R be relation in the set $\{1, 2, 3, 4\}$ given by $R = \{(1, 2), (2, 2), (1, 1), (4, 4), (1, 3), (3, 3), (3, 2)\}$. Then prove that R is reflexive and transitive but not symmetric.

(e) Find the domain of the function $f(x) = \dfrac{x^2+2x+1}{x^2-8x+12}$.

(f) Differentiate $ax^2 + bx + c$ from first principle.

(g) If $y = v^3 + 2v^2 + 5$, $v = 3u + 1$ and $u = 9x + 1$, then find dy/dx.

(h) Evaluate $\int \dfrac{dx}{1-\sin x}$.

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

(j) Prove that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$. (1.5×10=15)

PART-B

2. (a) If A and B are two sets containing 3 and 6 elements respectively, then find the minimum and maximum number of elements in $A \cup B$. (8)

(b) If $2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$ and $3X + 2Y = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$, then find X and Y. (7)

3. (a) If R is an equivalence relation on a set A, then show that R^{-1} is also an equivalence relation on A. (8)

(b) Evaluate

(i) $\lim\limits_{x\to 0} \dfrac{\sqrt{1+x}-\sqrt{1-x}}{2x}$

(ii) $\lim\limits_{x\to 3} \dfrac{3-x}{\sqrt{4+x}-\sqrt{1+2x}}$. (7)

4. (a) Find dy/dx of the following at the indicated points:

(i) $y = 2\sin^2 3x$ at $x = \pi/6$.

(ii) $y = \dfrac{1-\sin x}{\cos x}$ at $x = \pi/4$. (8)

(b) Find dy/dx if

(i) $y = \log \sqrt{\dfrac{1-\cos x}{1+\cos x}}$

(ii) $y = \log\left[e^x\left(\dfrac{x+2}{x-2}\right)^{3/4}\right]$ (7)

5. (a) Evaluate $\int x^2 \cos^2 x \, dx$. (8)

(b) Using Reduction formula, Evaluate $\int \sin^m x \cos^n x \, dx$, where m, n are positive integers. (7)

6. (a) Using determinants, find the area of the triangle whose vertices are given by :

(−3, 1), (2, −4) and (5, 1). Also check whether the given points are collinear. (8)

(b) Locate the point of discontinuity (if any) for the function:

$$f(x) = \begin{cases} x^3 - x^2 + 2x - 2, & x \neq 1 \\ 4, & x = 1 \end{cases}$$ (7)

7. (a) If $x^p y^q = (x+y)^{p+q}$, then prove that $\frac{dy}{dx} = \frac{y}{x}$. (8)

(b) State and prove the Fundamental Theorem of Integral Calculus. (7)
