

Roll No.000 700 8412

Total Pages : 04

BCA/D-17

1229

MATHEMATICS

BCA-113

Mathematical Foundation-I

Time : Three Hours]

[Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section. Q. No. 1 is compulsory.

1. (a) If $A = \{4, 5, 8, 12\}$, $B = \{1, 4, 6, 9\}$ and $C = \{1, 2, 3, 4\}$, then find $A - (C - B)$. 4
- (b) Find the value of n if : 3

$$\frac{|2n|}{|3| |2n-3|} : \frac{|n|}{|2| |n-2|} = 44 : 3$$

- (c) Prove that : 3

$$\lim_{x \rightarrow \infty} \frac{\sum n}{n^2} = \frac{1}{2}$$

- (d) Differentiate $\frac{x^2}{1+x^2}$ w.r.t. x^2 . 3

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P.T.O.

- (e) Find the order and degree of the following differential equation : 3

$$\frac{d^2 y}{dx^2} = \sqrt{1 + \frac{dy}{dx}}$$

Section I

2. (a) For a certain test a candidate could offer English or Hindi or both the subjects. Total number of students was 500, of whom 350 appeared in English and 90 in both subjects. Use set operation to show : 8
- (i) How many appeared in Hindi ?
 - (ii) How many appeared in English only ?
 - (iii) How many appeared in Hindi only ?
- (b) If R is an equivalence relation on a set A , show that R^{-1} is also an equivalence relation on A . 8
3. (a) If ${}^5P_r = 2 \cdot {}^6P_{r-1}$, find r . 3 8
- (b) There are 6 boys and 3 girls in a class. A committee of 5 is to be formed such that it contains 3 boys and 2 girls. In how many ways can this be done ? Also find the number of ways if at least one girl is always in the committee. 8

Section II

4. (a) Show that $\lim_{x \rightarrow 0} \frac{e^{1/x} - 1}{e^{1/x} + 1}$ does not exist. 8

- (b) If $y = \sqrt{\frac{1-x}{1+x}}$, prove that : 8

$$(1-x^2) \frac{dy}{dx} + y = 0$$

5. (a) If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, prove that : 8

$$\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$$

- (b) If $y = e^{ax} \sin bx$; prove that : 8

$$\frac{d^2y}{dx^2} - 2a \frac{dy}{dx} + (a^2 + b^2)y = 0$$

Section III

6. (a) Find the differential equation of the family of curves $y = Ae^{3x} + Be^{5x}$, where A and B are arbitrary constants. 8

- (b) Solve the differential equation : 8

$$(1+x^2) \frac{dy}{dx} + 2yx - 4x^2 = 0$$

7. (a) Solve the differential equation : 8

$$(x^2y - 2xy^2)dx - (x^3 - 3x^2y)dy = 0$$

- (b) Solve the differential equation : 8

$$(1 + e^{x/y})dx + e^{x/y} \left(1 - \frac{x}{y}\right)dy = 0$$

Section IV

8. (a) Solve the differential equation : 8

$$\frac{d^3y}{dx^3} + \frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin 2x$$

- (b) Solve the differential equation : 8

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = xe^x \sin x$$

9. (a) Solve the differential equation : 8

$$x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^4$$

- (b) Solve the differential equation : 8

$$(x+1)^2 \frac{d^2y}{dx^2} + (x+1) \frac{dy}{dx} = (2x+3)(2x+4)$$

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