Total No. of Questions : 9] [Total No. of Printed Pages : 7

(2102)

BCA (CBCS) RUSA Ist Semester Examination

3985

MATHEMATICS–I

BCA-0101

Time : 3 Hours] [Maximum Marks : 70

Note :– Attempt *five* questions in all, selecting *one* question each from Sections–A, B, C and D. Section E is compulsory and carries 30 marks. All other questions carry equal marks (10).

Section–A

1. (a) Find the solution of the equation :

$$\frac{4}{y} - 3 = \frac{5}{2y+3}$$

C–757 (1) Turn Over

(b) The fourth and tenth terms of an A.P. are respectively 7 and 19. Find its 15th term. $5 \times 2 = 10$

2. (a) If :

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$$

then verify that $(AB)' = B'A'$.

(b) Write the middle term in the expansion of

$$\left(x^2 - \frac{1}{x} \right)^{10}.$$

$5 \times 2 = 10$

Section–B

(a) Find the area of the triangle whose vertices are

$(2, 3), (5, 7)$ and $(-3, 4)$.

(b) Find the equation of the straight line passing through the point $(1, 1)$ and parallel to the line

$4x + 4y + 7 = 0$.

5×2

-757

(2)

Find the equation of the circle whose centre is

at $(-4, 2)$ and which touches the line

$x - y = 3$.

(b) What is the value of y so that the line through

$(3, y)$ and $(2, 7)$ is parallel to the line through

$(-1, 4)$ and $(0, 6)$? 5×2=10

Section–C

5. (a) Prove that :

$$\sqrt{\frac{1-\cos A}{1+\cos A}} = \operatorname{cosec} A - \cot A$$

(b) Prove that :

$$\sin 10° \sin 30° \sin 50° \sin 70° = \frac{1}{16} \qquad 5×2=10$$

6. (a) If $A + B + C = 180°$, then prove that :

$$\sin 2A + \sin 2B + \sin 2C$$

$$= 4 \sin A \sin B \sin C$$

Turn Over

C–757 (3)

(b) A vertical flagstaff stands on a horizontal plane; from a point distant 45 meters from its foot, the angle of elevation of its top is found to be $30°$, find the height of the flagstaff.

$5 \times 2 = 10$

Section–D

7. (a) If the function :

$$f(x) = \begin{cases} 3ax + b & \text{if } x > 1 \\ 11 & \text{if } x = 1 \\ 5ax - 2b & \text{if } x < 1 \end{cases}$$

is continuous at $x = 1$, find the values of a and b.

b) If $y \log x = x - y$, show that :

$$\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$$

$5 \times 2 = 10$

) Find the maximum and minimum values of the function :

$$2x^3 - 9x^2 - 24x + 8$$

Evaluate :

$$\int_0^2 xe^{3x} \, dx$$

$5 \times 2 = 10$

(4)

Section–E

(Compulsory Question)

(A) (i) If X and Y are two sets such that

$$n(X) = 17, \ n(Y) = 23, \ n(X \cup Y) = 38,$$

find $n(X \cap Y)$.

(ii) Find the coefficient of x^6 in the expansion of $(1 + x)^8$.

(iii) $\csc^2 \theta - \cot^2 \theta = $ ....

(Fill in the blank)

(iv) Write the equation of the straight line passing through the points $(1, -1)$ and $(3, 5)$.

(v) Construct a 2×3 matrix whose elements are given by $a_{ij} = i + 2j$.

(vi) Evaluate :

$$\underset{x \to 3}{Lt} \ \frac{x^2 + 2x - 15}{x^2 - 9}$$

(5)

(vii) Find the domain and range of the function :

$$f(x) = \frac{|x-3|}{x-3}$$

(viii) Find the derivative $\frac{dy}{dx}$, when $y = x^x$.

(ix) Evaluate :

$$\int \frac{dx}{x(1+\log x)^2}$$

(x) $(AB)^{-1} = B^{-1}A^{-1}$, where A and B are

two non-singular matrices of the same

order. (True/False)

$$1 \times 10 = 10$$

(i) Solve the following linear equations using

determinants :

$$3x - 2y = 4$$

and $\qquad 4x - 3y = 5$

(ii) Using distance formula, show that the

points $(-1, 2)$, $(5, 0)$ and $(2, 1)$ are

collinear.

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(6)

(iii) Solve :

$$2\sin^2\theta + \sqrt{2}\cos\theta - 2 = 0,$$

where θ is positive acute angle.

(iv) Find the equation of the circle, when the end points of a diameter are $(-2, -3)$, and $(-3, 5)$.

(v) Find the following integral :

$$\int \frac{\cos x}{1+\sin x}\,dx.$$

$4\times5=20$