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

(2111)

BCA (CBCS) RUSA Ist Semester Examination

4508

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) Solve the equation $4^{1+x} + 4^{1-x} = 10$.

(b) The sum of three numbers in A.P. is 24 and the product is 440. Find the numbers. 5×2=10

2. (a) Find the coefficient of x^5 in the expansion of $(x + 3)^8$.

(b) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, $f(x) = x^2 - 2x - 3$, show that $f(A) = 0$. 5×2=10

Section–B

3. (a) Find the centroid of the triangle whose vertices are $(1, -1)$, $(4, 3)$, $(1, 1)$.

(b) The perpendicular from the origin to the line $y = mx + c$ meets it at the point $(-1, 2)$. Find the values of m and c. 5×2=10

4. (a) Find the distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$.

(b) Show that the line $x + y = 5$ touches the circle $x^2 + y^2 - 2x - 4y + 3 = 0$. Find the point of contact. 5×2=10

Section–C

5. (a) Prove that :

$$\frac{\tan\theta - \cot\theta}{\sin\theta\cos\theta} = \sec^2\theta - \operatorname{cosec}^2\theta$$

(b) Find the value of :

$$\frac{\tan 69° + \tan 66°}{1 - \tan 69° \tan 66°}$$

5×2=10

6. (a) Solve $\sin x + \sin 3x + \sin 5x = 0$.

(b) Two trees A and B are on the same side of a river. From a point C in the river the distance of the trees A and B is 2.50 m and 300 m respectively. If the angle C is 45°, find the distance between the trees. $(\sqrt{2} = 1.414)$ 5×2=10

Section–D

7. (a) Evaluate the limit :

$$\lim_{n\to\infty} \frac{6x^2+2x+1}{6x^2-3x+1}$$

(b) Differentiate :

$$\frac{3x}{7x^2+8} \text{ w.r.t. } x.$$ 5×2=10

8. (a) Integrate :

$$\int \frac{2x+1}{(x+1)(x-2)}\,dx$$

$\frac{f'(x)}{f(x)}$

(b) Evaluate :

$$\int_1^2 \frac{x^2}{x-1}\,dx$$ 5×2=10

Section–E

(Compulsory Question)

9. (A) (i) Write the solution set of $x^2 + x + 2 = 0$ in roaster form.

(ii) Without solving the equation $3x^2 - 7x + 2 = 0$, find the sum and the product of its roots.

(iii) Find the 17^{th} and 20^{th} terms in the sequence whose n^{th} term is $a_n = 4n - 3$.

(iv) Insert 3 geometric means between 2 and 32.

(v) If a matrix has 8 elements, what are the possible orders it can have ?

(vi) Without expanding show that :

$$\begin{vmatrix} 5 & 15 & 3 \\ 7 & 21 & 5 \\ 8 & 24 & -7 \end{vmatrix} = 0.$$

(vii) Find the complement of the angle $67°30'$.

(viii) Show that the triangle whose vertices are (8, 2), (5, –3) and (0, 0) is an isosceles triangle.

(ix) Write the equation of the line with slope 3 and y intercept –5.

(x) Evaluate :

$$\int \sec x(\sec x + \tan x)\, dx$$

1×10=10

(B) (i) If α, β are roots of $x^2 - 2x + 3 = 0$, form an equation whose roots are $\alpha + 2$, $\beta + 2$.

(ii) Find the term independent of x in the expansion of $\left(2x - \frac{1}{x}\right)^{10}$. Also find its value.

(iii) Without expanding show that :

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a).$$

(iv) Show that the lines : $5x - 3y - 1 = 0$, $2x + 3y - 23 = 0$, $42x + 21y - 257 = 0$ are concurrent. Also find the point of concurrence.

(v) Prove that :

$$\lim_{h \to 0} \frac{(x+h)^m - x^m}{h} = mx^{m-1}$$

4×5=20