Roll No …………………….. **028/A**

Total No. of Question :] **MATHEMATICS** [Total No. of Printed pages :]

SS

2036

ANNUAL EXAMINATION SYSTEM

Time allowed: 3 Hours Maximum Marks:70

Note: You must write the subject – code/paper code 028/A in the box provided on the title page of your answer book.

1. (1) Principal value of $\sin^{-1}\left(\frac{-1}{2}\right)$ is :

(a) $\frac{5\pi}{6}$ (b) $\frac{\pi}{6}$

(c) $\frac{-\pi}{6}$ (d) $\frac{-5\pi}{6}$

(ii) If AB=C where B and C are matrices of order 3 x 5 then the order of matrix A is :

(a) 3x5 (b) 3x3

(c) 5x5 (d) 5x3

(iii) If (x) = $\begin{cases} kx^2 & , \quad x < 2 \\ 3 & , \quad x \geq 2 \end{cases}$ is continuous at x=2 then value of k is :

(a) $\frac{2}{3}$ (b) $\frac{4}{3}$

(c) $\frac{3}{2}$ (d) $\frac{4}{3}$

(iv) $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx \ is \ equal \ to$:

(a) $e^x \log x + c$ (b) $\frac{1}{x} e^x + c$

(c) $\frac{-1}{x^2} e^x + c$ (d) $x \log x + c$

(v) $\int_u^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\sin x}} dx \ is \ equal \ to$;

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$

(c) π (d) 2π

(vi) Differential equation representing the curve y = sin x is :

(a) $y_2 - y = 0$ (b) $y_2 - y_1 = 0$

(c) $y_2 + y = 0$ (d) $y_1 + y = 0$

(vi) $if \ \vec{a} = 2\hat{\imath} - \hat{\jmath} + \hat{k} \ and \ \vec{b} = -2\hat{\imath} + \hat{\jmath} + \hat{k}$ then vector in the direction of $\vec{a} + \vec{b}$ with magnitude 9 is:

(a) $9\hat{k}$ (b) $3\hat{k}$

(c) $\hat{k}$ (d) $6\hat{k}$

(vii) Distance between the point (0,1,7) and plane 3x+4y+1=0 is :

(a) 1 unit (b) 2 unit

(c) 3 unit (d) 4 unit

(viii) Distance between the point (0,1,7) and the plane 3x+4y+1=0 is R={(P_1, P_2): and P_1 and P_2 have same numbers of sides} is an equivalence relation.

OR

Show that function defined by f : Z→Z, f(x) = x^3 is one – one but not onto.

3. Prove that 2 $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{7} = \tan^{-2}\frac{31}{17}$

4. If A = $\begin{bmatrix} 3 \\ -1 \\ 5 \end{bmatrix}$, B= [-6 7 10] then verify that (AB)' = B'A'

OR

If f(x)= $\begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then show that f(x) f(y) = f(x+y).

5. If y = $x^{\cos x} + (\cos x)\, then\, find \frac{dy}{dx}$.

6. If y = $\left[x + 3 + \sqrt{x^2 + 6x + 10}\right]^n$ then prove that $(x^2 + 6x + 10)y_2 + (x + 3)y_1 - n^2y = 0$.

7. Find the equation of normal to the curve y= $x^3 + 5x^2 - 10x + 11$ where normal is parallel to the line x-2x+10=0.

OR

Using differential find the approximate value of $(0.731)^{1/3}$

8. Evaluate $\int \frac{x^2+1}{x^4+1}\, dx$.

9. Evaluate $\int_0^4 (x^2 + 2x)\, dx$ as limit of a sum.

10. Find the area bounded by the region given by $A = \left\{(x, y): \frac{x^2}{25} + \frac{y^2}{9} \leq 1 \leq \frac{x}{5} + \frac{y}{3}\right\}$

11. Find the particular solution of the differential equation $\sec^2 x \tan y\ dx - \sec^2 y \tan x\ dy = 0$ given that y=$\frac{\pi}{6}, x = \frac{\pi}{3}$.

12. Find the particular solution of the differential equation $\sin x \frac{dy}{dx} + y \cos x = 4x, (x \neq 0)$ given that y = 0, $x = \frac{\pi}{2}$.

13. The two adjacent sides of a parallelogram are given by the vectors $2\hat{\imath} - 4\hat{\jmath} + 5\hat{k}$ and $\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$. Find a unit vector parallel to its diagonal (longer). Also find the area of parallelogram.

OR

Using scalar triple product, show that the four points given by position vectors $4\hat{\imath} + 5\hat{\jmath} + \hat{k}, -\hat{\imath} - \hat{k}, 3\hat{\imath} - 9\hat{\jmath} + 4\hat{k}$ and $-4\hat{\imath} + 4\hat{\jmath} + 4\hat{k}$ are coplanar.

14. IF A and B are two independent events such that P(A)= $\frac{1}{2}, P(B) = p\ and\ P(A \cup B) = \frac{3}{5}\, then\, find\, p$.

15. Bag I contains 3 red and 5 white balls and bag II contains 4 red and 6 white balls. One of the bags is selected at random and a ball is drawn from it. The ball is found to be red. Find the probability that ball is drawn from bag II.

16. Solve the following system of linear equations by matrix method: x-y+z=4,2x+y-3z=0,x+y+z=2.

OR

Express A= $\begin{bmatrix} 1 & -2 & 3 \\ 7 & 0 & 5 \\ -4 & 1 & 9 \end{bmatrix}$ as sum of a symmetric matrix and a skew-symmetric matrix.

17. Show that the radius of right circular cylinder of maximum volume , that can be inscribed in a sphere of radius 18cm, is $6\sqrt{6}\ cm$.

18. Find the shortest distance between the lines given by the equation:

$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} - 3\hat{j} + 4\hat{k})$ and $\vec{r} = (2\hat{i} - 4\hat{j} + 5\hat{k}) + \mu(3\hat{i} - 4\hat{j} + 5\hat{k})$

OR

Find the image of the point (1,2,3) in the plane (as mirror) given by the equation 3x+2y+z=24.

19. Graphically maximize Z=9x+10y subject to the constraints.
$9x+2y \geq 20, x - 2y \geq 0, x + y \leq 9, x \geq 0, y \geq 0.$