CLASS XII
SAMPLE PAPER
MATHS

Time : 3 Hours **M.M. 100**

Instructions -All questions are compulsory, there are three sections A, B and C.
This question paper consists of 29 questions. Questions from 1 to 10 are of 01 marks each, questions from11 to 22 are of 04 marks each and questions from 23 to 29 are of 06 marks each.

SECTION – A

1.If A and B are square matrices of the same order and A is skew-symmetric, prove that $B'AB$ is also skew-symmetric.

2.For what value of x ,the matrix $\begin{bmatrix} 2x-1 & 3 \\ x+2 & 4 \end{bmatrix}$ is singular?

3.How many matrices are possible of order 3 X 3 with each entry 0 or 1.

4. Find the derivative of $\cos x^{\sin x}$

5. Evaluate: $\int_{-\pi}^{\pi} \cos x \, sin^{19} x \, dx$

6. Evaluate: $\int \frac{1}{1+\sqrt{x}} dx$

7. Write the order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{d^2y}{dx^2}\right)^3 + 2 = 0$

8.If $\vec{a} = \hat{\imath} + \hat{\jmath}$, $\vec{b} = \hat{\jmath} + \hat{k}$ and $\vec{c} = \hat{k} + \hat{\imath}$,find a unit vector in the direction of $\vec{a} + \vec{b} + \vec{c}$.

9. If f(x) = 3x + 4 , Find the value of $f^{-1}(f(2))$

10. Find the value of $cos^{-1}\left(\frac{1}{2}\right) + 2sin^{-1}\left(\frac{1}{2}\right)$

SECTION-B

11.Prove that: $sin^{-1}\left(\frac{3}{5}\right) - sin^{-1}\left(\frac{8}{17}\right) = cos^{-1}\left(\frac{84}{85}\right)$

12. Prove that the determinant $\begin{vmatrix} x & \sin\theta & cos\theta \\ -sin\theta & -x & 1 \\ cos\theta & 1 & x \end{vmatrix}$ is independent of θ.

OR

Evaluate the determinant $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix}$ = 3abc $-a^3 - b^3 - c^3$

13. Differentiate: $\sin^3(2x - 1)$ w.r.t. $\cos^3 x$

14. If cos y = x cos (a + y) with cos a ≠ ±1, prove that $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$.

OR

Find the point on the curve y = x^2 where the slope of the tangentvis equal to the coordinate of the point.

15.Find the value of λ , so that the function $f(x) = \begin{cases} \frac{\lambda \cos x}{\pi - 2x} & if\ x \neq \frac{\pi}{2} \\ 3, & \text{if } x = \frac{\pi}{2} \end{cases}$,

is continuous at x = $\frac{\pi}{2}$.

16. Evaluate: $\int_0^{\pi} cos2x\ logsinx dx$

17. Evaluate: $\int \frac{e^x}{\sqrt{5 - 4e^x - e^{2x}}} dx$.

18. Find the scalar components of a unit vector which is perpendicular to each of the vectors $\hat{i} + \hat{j} - 2\hat{k}$ and $3\hat{i} - \hat{j} + 3\hat{k}$.

OR

Find the area of the triangle with position vectors of the vertices $\hat{\imath}+\hat{\jmath}$, $\hat{\imath}+2\hat{\jmath}-3\hat{k}$ and $4\hat{\imath}+3\hat{\jmath}+\hat{k}$.

19. Evaluate: $\int_0^{\pi} \frac{x\,sinx}{(1+cos^2 x)} dx$

20. Solve the differential equation : $\frac{dy}{dx}$ =sin(x + y) +cos (x+ y)

OR

Solve the differential equation : cos x$\frac{dy}{dx}$ + y = sin x

21 Let * be a binary operation on N X N defined by (a, b) * (c, d) = (a+c, b+d).Show that * is commutative and associative. Find the identity element for * on N X N, if any.

22. Two dice are thrown simultaneously. Let x denote the number of sixes. Find the probability distribution of x. Also find the mean and variance of x.

SECTION – C

23 A pack of playing cards was found to contain only 51 cards. If the first 13 cards which were examined are all red, What is the probability that the missing card is black.

24. Two sides of a triangle have length 'a' and 'b' angle between them is θ. What value of θ will maximize the area of the triangle ? Also find the maximum area of the triangle.

OR

Prove that the area of a right-angled triangle of given hypotenuse is maximum when the triangle is isosceles.

25. If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ Find A^{-1} and using it solve: x + 2y + z = 0, - x + y + z = 0 and x – 3y + z = 2

26. Find the area of the region included parabola $4y = 3x^2$ and the circle $x^2 + y^2 = 9$.

OR

Find the value of $\int_1^3 (x^2 + x + 1)\, dx$ by using limit sum

27. Find the distant of the point (3, - 2, 1) from the plane 3x – y + 4z = 2 and measure parallel to the line $\frac{x-1}{1} = \frac{y+2}{-1} = \frac{z}{2}$.

28. Find the shortest distance between the lines, $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$.

OR Find the vector equation of a plane passing through the intersection of the planes $\vec{r} = (\hat{i} + \hat{j} + \hat{k}) = 6$ and $\vec{r} = (2\hat{i} + 3\hat{j} + 4\hat{k}) = -5$ and parallel to the line $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(2\hat{i} - 3\hat{j} + 2\hat{k})$

29. Two tailors A and B earn Rs 150 and Rs 200 per day respectively . A can stitch 6 shirts and 4 pants per day and B can stitch 10 shirts and 4 pants per day. How many days shall each work, if it is desired to produce atleast 60 shirts and 32 pants at a minimum labour cost ? Solve this problem graphically.

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