INDIAN SCHOOL MUSCAT
PRACTICE PAPER -2 - (2018 –19)
MATHEMATICS (041)

CLASS XII

SECTION A

Questions 1 to 4 carry 1 mark each.

1. Find the value of m+n, where m and n are order and degree of differential equation

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

2. Given a square matrix A of order $3X3$ such that $|A|=12$, find the value of $|A\ adj\ A|$

3. If $y=\tan^{-1}\sqrt{\frac{1-\cos x}{1+\cos x}}$, find $\frac{dy}{dx}$

4. Find the direction cosines of the line $\frac{4-x}{2}=\frac{y}{6}=\frac{1-z}{3}$

OR

If a line makes angles $90°, 60°\ and\ \theta$ with $x, y\ and\ z$ – axes respectively, where θ is acute, then find θ

SECTION B

Questions 5 to 12 carry 2 marks each

5. If the binary operation * on the set z of integers is defined by a*b=a+b-5, then write the identity element for the operation * in z.

6. If $A=\begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, find k so that $A^2=5A+kI$

7. Find $\int\frac{\sqrt{\tan x}}{\sin x\cos x}dx$

8. Find $\int\frac{(x-4)}{(x-3)^2}e^x dx$ **OR** Find $\int\frac{\sin x}{\sin(x+a)}dx$

9. Form the differential equation representing the family of curves $y=a\sin(x+b)$

10. If $|\vec{a}|=|\vec{b}|$ and angle between $\vec{a}$ and $\vec{b}$ is $60°$ and $\vec{a}.\vec{b}=\frac{1}{2}$, then find $|\vec{a}|$

OR

If two vectors $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}| = 2, |\vec{b}| = 1$ and $\vec{a}.\vec{b} = \frac{1}{2}$, then find the value of $(3\vec{a} - 5\vec{b}).(2\vec{a} + 7\vec{b})$

11. A pair of dice is thrown find the probability of getting a sum of 10 or more, if 5appears on the first die.

OR

Two persons A and B appear in an interview for two vacancies for the same post. The probability that A will be selected is $\frac{1}{5}$ and B will be selected is $\frac{1}{4}$. What is the probability that

(i) Any one of them will be selected. (ii) Atleast one of them will be selected.

12. A bag A contains 4 black and 6 red balls and bag B contains 7 black and 3 red balls. A die is thrown. If 1 or 2 appears on it, then bag A is chosen, otherwise bag B. If two balls are drawn at random (without replacement) from the selected bag, find the probability of one of them being red and another black.

SECTION C

Questions 13 to 23 carry 4 marks each

13. Solve for x

$$\tan^{-1}\left(\frac{x-3}{x-4}\right)+\tan^{-1}\left(\frac{x+3}{x+4}\right)=\frac{\pi}{4}$$

14. Let N denote the set of all natural numbers and R be the relation on NxN defined by (a,b)R(c,d) if ad(b+c)=bc(a+d) . Show that R is an equivalence relation.

OR

Consider $f: R_+ \to (-9,\infty)$ given by $f(x) = 5x^2 + 6x - 9$. Prove that f is invertible with $f^{-1}(y) = \frac{\sqrt{5y+54}-3}{5}$

15. Using properties of determinants, Prove that

$$\begin{vmatrix} b+c & c+a & a+b \\ q+r & r+p & p+q \\ y+z & z+x & x+y \end{vmatrix} = 2\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix}$$

16. If $y = (\log x)^x + x^{\log x}$, find $\frac{dy}{dx}$

OR

Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$

17. If $y = a\cos(\log x) + b\sin(\log x)$, then show that $x^2\left(\frac{d^2y}{dx^2}\right) + x\left(\frac{dy}{dx}\right) + y = 0$

18. Find the equation of the tangent to the curve $y = \sqrt{3x-2}$ which is parallel to the line

$4x - 2y + 5 = 0$

19. Find $\int \frac{2x+5}{\sqrt{7-6x-x^2}}\,dx$

20. Using properties of definite integrals evaluate $\int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}\,dx$

21. If y(t) is a solution of $(1+t)\frac{dy}{dx} - ty = 1$ and y(0)=-1,then show that y(1)= $\frac{-1}{2}$

OR

Find the general solution of the differential equation
$[\tan^{-1} x - y]dx = (1+x^2)dy$

22. Find the value of λ, if 4 points with position vectors $3\hat{i}+6\hat{j}+9\hat{k}, \hat{i}+2\hat{j}+3\hat{k}, 2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+6\hat{j}+\lambda\hat{k}$ are coplanar.

23. Find the coordinates of the foot and length of the perpendicular drawn from a point A(2,-1,5) to the line $\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11}$

SECTION D

Questions 24 to 29 carry 6 marks each

24. If A=$\begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$, find A^{-1}

Hence, solve the system of equations $3x + 3y + 2z$=1; $x + 2y = 4$; $2x - 3y - z = 5$

OR

Find the inverse of the following matrix using elementary transformations

$$\begin{bmatrix} 2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3 \end{bmatrix}$$

25. Show that the semi-vertical angle of a right circular cone of given total surface area and the maximum volume is $\sin^{-1}\left(\frac{1}{3}\right)$

26. Make a rough sketch of the region given below and find its area using methods of integration : $\{(x, y): 0 \le y \le x^2 + 3, 0 \le y \le 2x+3, 0 \le x \le 3\}$.

OR

Sketch the graph of $f(x)=\begin{cases}|x-2|+2, x\le 2\\ x^2-2, x>2\end{cases}$ .Evaluate $\int_0^4 f(x)dx$. What does the value of this integral represent on the graph?

27. Find the equation of a plane through the line of intersection of the planes $2x+y-z=3$ and $5x-3y+4z+9=0$ and parallel to a line $\frac{x-1}{2}=\frac{y-3}{4}=\frac{z-5}{5}$

OR

Find the equation of the plane passing through three points A(3,-1,2), B(5,2,4) and C(-1,-1,6). Also find the distance of the point P(6,5,9) from the plane.

28. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1,2,3 or 4 , she tosses a coin once again and notes whether a head or tail is obtained. If she obtained exactly two heads what is the probability that she threw 1,,2,3 and 4 with a die?

29. A small firm manufactures gold rings and chains. The total number of rings and chains manufactured per day is at most 24. It takes 1 hour to make a ring and 30 minutes to make a chain. The maximum number of hours available per day is 16. If the profit on a ring is ₹300 and that on a chain is ₹900, find the number of rings and chains that should be manufactured per day, so as to earn the maximum profit. Make it as an L.PP and solve it graphically.

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