Term-II

Examination April, 2022

Mathematics-XII

Pattern of the Question Paper

Model Question Paper

Time allowed : 3 hrs. **M.M-50**

Q. No. 1 to 20 are of 1 marks each (MCQ)

Q.No. 21 to 26 are of 3 marks.

Q.No. 27 to 28 are of 6 marks

1. The slope of the normal to the curve $Y = 2x^2 + 3\sin x$ at $x = 0$ is

   (a) 3 (b) $\frac{1}{3}$

   (c) –3 (d) $\frac{-1}{3}$

2. $\int \frac{dx}{\sqrt{1-x^2}}$ equals to

   (a) $\sin^{-1}x + c$ (b) $\tan x + c$

   (c) $-\cos^{-1}x + c$ (d) None of these

3. $\int \frac{dx}{x^2+2x+2}$ equals to

   (a) $x\tan^{-1}(x+1) + c$ (b) $\tan^{-1}(x+1) + c$

   (d) $(x+1)\tan^{-1}x + c$ (d) $\tan^{-1}x + c$

4. $\int a^x dx$ equals to

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

(c) $\frac{a^x}{\log a} + c$ (d) $a^x + c$

5. $\int x^2 e^{x^3} dx$ equals to

(a) $\frac{1}{3} x e^{x^3}$ (b) $\frac{1}{3} e^{x^3} + c$ (c) $\frac{1}{2} e^{x^3} + c$ (d) None of these

6. $\int x.\sin x\, dx$ equals.

(a) $-x \sin x + \cos x + c$ (b) $-x \cos x + \sin + c$

(c) $-x \cos x - \sin x + c$ (d) $\sin x + \cos x + c$

7. $\int \frac{(\log x)^2}{x} dx$ equals

(a) $\frac{1}{3} (\log |x|)^3 + c$ (b) $\frac{\log x}{x}$

(c) $\frac{(\log x)^3}{x^3}$ (d) None of these

8. $\int \frac{dx}{\sin^2 x \cos^2 x}$ equals

(a) $\tan x + \cot x + c$ (b) $\tan x - \cot x + c$

(c) $\tan x \cot x + c$ (d) $\tan x - \cot 2x + c$

9. $\int \sec x \, dx$ equals to

(a) $\log |\sec x + \tan x| + c$ (b) $\sec x - \tan x + c$

(c) $\log |\sec x - \tan x| + c$ (d) $\log |\operatorname{cosec} x - \cot x| + c$

10. Area of the region bounded by the curve $y^2 = 4x$, y – axis and the line $y = 3$ is

(a) 2 (b) $\frac{9}{4}$

(c) $\frac{9}{5}$ (d) $\frac{9}{2}$

11. The order of the differential equation $2x^2 \frac{d^2y}{dx^2} - \frac{3dy}{dx} + y = 0$ is

(a) 2 (b) 1

(c) 0 (d) Not defined

12. The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is

(a) $e^x + e^{-y} = c$ (b) $e^x + e^y = c$

(c) $e^{-x} + e^y = c$ (d) $e^{-x} + e^{-y} = c$

13. The number of arbitrary constants in the General solution of a differential equation of fourth order are

(a) 0 (b) 2 (c) 3 (d) 4

14. The angle between two non-zero vector $\vec{a}$ and $\vec{b}$ is given by

(a) $\sin\theta = \dfrac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|}$ (b) $\sin\theta = \dfrac{\vec{a}\times\vec{b}}{|\vec{a}||\vec{b}|}$

(c) $\sin\theta = \dfrac{\vec{a}.\vec{b}}{|\vec{a}||b|}$ (d) None of these

15. What is the projection of the vector $\hat{i}-\hat{j}$ the vector $\hat{i}+\hat{j}$

(a) 0 (b) 1 (c) 2 (d) 3

16. The value of $|\vec{a}\times\vec{b}|$ if $\vec{a} = 2\hat{i}+2\hat{j}+3\hat{k}$ and $\vec{b} = 3\hat{i}+5\hat{j}-2\hat{k}$

(a) $\sqrt{705}$ (b) $\sqrt{507}$

(c) 507 (d) 0

17. If a line has direction ratio 2, –1, –2 Then the direction cosines are

(a) $\dfrac{3}{2}, \dfrac{-1}{3}, \dfrac{-2}{3}$ (b) $-\dfrac{1}{3}, \dfrac{2}{3}, \dfrac{-2}{3}$

(c) $\dfrac{2}{3}, \dfrac{-1}{3}, \dfrac{-2}{3}$ (d) None of these

18. What is the equation of the plane with intercepts 2, 3 and 4 on the x, y and z – axis respectively.

(a) $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=1$ (b) $\frac{x}{2}+\frac{y}{3}+\frac{z}{4}=0$

(c) $2x + 3y + 4z = 1$ (d) $\frac{x}{4}+\frac{y}{3}+\frac{z}{2}=1$

19. If $P(A) = \frac{1}{2}$, $P(B) = 0$, Then $P(A/B)$ is

(a) = 0 (b) $\frac{1}{2}$

(c) Not defined (d) 1

20. The probability of obtaining an even prime number an each dice, when a pair of dice is called as

(a) 0 (b) $\frac{1}{3}$

(c) $\frac{1}{12}$ (d) $\frac{1}{36}$

21. Find the equation of the tangent to the curve at the pts.

$y = x^4 - 6x^3 + 13x^2 - 10x + 5$ at (0,5)

OR

Find the equation of the normal at the point (am^2, am^3) for the curve $ay^2 = x^3$

22. Integrate the functions

(a) $\int \frac{x^3 \sin(\tan^{-1} x^4)}{1+x^8} dx$ OR $\int \frac{3x-1}{(x-1)(x-2)(x-3)} dx$

(b) $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x + \sqrt{\cos x}}} dx$ OR $\int e^x (\sin x + \cos x) dx$

23. Find area of the region bounded by ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

OR

Find the area bounded by the curve $(x-1)^2 + y^2 = 1$ and $x^2 + y^2 = 1$

24. Find the general solution of the differential equation

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

OR

$(x^2 + xy)\, dy = (x^2 + y^2)\, dx$

25. If $\vec{a}, \vec{b}, \vec{c}$ are unit vector such that $\vec{a} + \vec{b} + \vec{c} = 0$

find the value of $\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}$ is

OR

Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{i} - \hat{j}\ \vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

26. A dies is thrown 6 times. If "getting an odd number" is a success, what is the probility of

(a) 5 success (b) at most 5 success

OR

If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$, find $P(A \cap B)$, If and A and B are independent events.

27. Find the shortest distance between the lines

$\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + (\hat{i} + \hat{j} + \hat{u})$ and

$\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + (2\hat{i} + \hat{j} + 2\hat{k})$

28. Solve the linear programming problem graphically Maximize $Z = 5x + 3y$

Subject to $3x + 5y \leq 15$, $5x + 2y \leq 10$ $x \geq 0$ $y \geq 0$