

**Himachal Pradesh Board of School Education
Dharamshala
Model Question Paper**

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. $\int x \cdot \sin x dx$ equals.

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

(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) $\sin \theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$

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

(c) $\sin \theta = \frac{|\vec{a} \cdot \vec{b}|}{|\vec{a}| |\vec{b}|}$

- (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) $\frac{2}{3}, \frac{-1}{3}, \frac{-2}{3}$

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

(c) $\frac{2}{3}, \frac{-1}{3}, \frac{-2}{3}$

- (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 on 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

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

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

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 $\vec{a} + \vec{b} + \vec{c} = \vec{0}$

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

OR

Find the area of the parallelogram whose adjacent sides are deter-

mined by the vectors $\hat{a} = \hat{i} - \hat{j}$ and $\hat{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

26. A die is thrown 6 times. If “getting an odd number” is a success, what is the probability 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 A and B are independent events.

27. Find the shortest distance between the lines

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

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

28. Solve the linear programming problem graphically Maximize

$$Z = 5x + 3y$$

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