# Class – XII ( Board Mock Test) – 2010

**Max. Marks: 100** **Max. Time: 2.5hrs**

General Instructions:

1. All questions are compulsory
2. This question paper consists of **29** questions divided into three sections **A**, **B** and **C**. Section A comprises of **10** questions of **one mark** each, section **B** comprises of **12** questions of **four marks** each and section **C** comprises of **07** questions of **six marks** each
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question
4. There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

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## SECTION – A

1. Determine whether that the relation R in the set A of human beings in a town at a particular time given by $R=\{(x,y): x \text{ is wife of } y\}$ is transitive or not.

2. Integrate, $\int_0^{\pi/2} \log\left[\frac{3+5\cos x}{3+5\sin x}\right]dx$

3. $\begin{vmatrix} 1 & xy & z(x+y) \\ 1 & yz & x(y+z) \\ 1 & zx & y(x+z) \end{vmatrix} = ?$

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

5. Find the area of the parallelogram whose adjacent sides are the vectors $\hat{i}-\hat{j}+3\hat{k}$ and $2\hat{i}-7\hat{j}+\hat{k}$.

6. The probability of a man hitting a target is $\frac{1}{3}$ , if he fires 3 times, what is the probability of his hitting at least once?

7. The slope of the curve $2y^2 = ax^2 + b$ at (1, -1) is -1, Find $a$ and $b$ ?

8. If A and B are two events such that $P(A)=0.3,\ P(B)=0.6\ \&\ P(B/A)=0.5$, find $P(A\cup B)$.

9. Write the order and degree of the differential equation, $y = x\frac{dy}{dx} + a\sqrt{1+\left(\frac{dy}{dx}\right)^2}$ .

10. If $f(1)=4,\ f'(1)=2$, find the value of the derivative of $\log f(e^x)$ w.r.t $x$ at the point $x=0$ ?

## SECTION – B

11. Show that the function $f:R\to R$ defined by $f(x)=\frac{2x-1}{3}, x\in R$ is one-one and onto function . Also find the inverse of $f$ .

12. Solve for $x$: $Sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$ .

**OR**

$$2\tan^{-1}(\sin x) = \tan^{-1}(2\sec x), 0 < x < \frac{\pi}{2}$$

13. Prove that, $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ca & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} = (ab+bc+ca)^3$

**OR**

$$\begin{vmatrix} (b+c)^2 & ab & ca \\ ab & (a+c)^2 & bc \\ ac & bc & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

14. Find the value of $a$ and $b$, such that the function defined by

$$f(x) = \begin{cases} \frac{x-4}{|x-4|} + a & if \quad x<4 \\ a+b & if \quad x=4 \\ \frac{x-4}{|x-4|} + 2b & if \quad x>4 \end{cases}$$ is continuous at $x = 4$ .

15. If y = $[\log(x+\sqrt{x^2+1})\ ]^2$, *Show that* $(1+x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 2$ .

**OR**

Find $\frac{dy}{dx}$ if $\sin xy + \cos y = \frac{\pi}{2}$ .

16. Find the intervals in which the function $f$ given by $f(x) = \frac{4\sin x - 2x - x\cos x}{2+\cos x}$ on $[0, 2\pi]$ is (i) increasing, (ii) decreasing.

17. Evaluate, $\int \frac{\sin 4x - 2}{1-\cos 4x} e^{2x} dx$ .

18. Using limit of sum find $\int_1^3 \left(3x^2 + e^{2x}\right) dx$ **OR** Evaluate: $\int_0^{3/2} \left| x \cos \pi x \right| dx$.

19. Solve the differential equation, $\left(1 + y + x^2 y\right) dx + \left(x + x^3\right) dy = 0$ where $y = 0$ when $x = 1$.

20. Find a unit vector perpendicular to the vectors $3\hat{i} + 2\hat{j} - \hat{k}$ and $-2\hat{i} + \hat{j} + \hat{k}$ taking $\vec{a} = 3\hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = -2\hat{i} + \hat{j} + \hat{k}$.

21. Find the equation of planes passing through the point (-1,-1,2) and perpendicular to the planes $x + 2y - 3z = 1$ and $5x - 4y + 3z = 5$.

**OR**

The eq. of the lines are $\frac{x-1}{1} = \frac{y-2}{-3} = \frac{z-3}{2}$ and $\frac{x-4}{2} = \frac{y-5}{3} = \frac{z-6}{1}$. Find the shortest distance between the above lines.

22. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is 5/6. What is the probability that he will knock down fewer than 2 hurdles.

## SECTION – C

23. Find the inverse using elementary transformation, $\begin{bmatrix} 9 & 7 & 3 \\ 5 & -1 & 4 \\ 6 & 8 & 2 \end{bmatrix}$.

24. A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2m and volume is 8*m*3 .If building of tank costs Rs70 per sq. metres for the base and Rs45 per square metre for sides. What is the cost of least expensive tank?

25. Evaluate: $\int_0^{\pi/2} \frac{dx}{1 + \sin x + \cos x}$

26. A and B throw a die alternatively till one of them gets a '6' and wins the game. Find their respective probabilities of winning, if A starts first.

**OR**

Assume that the chance of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug reduces its chances by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga?

27. Find the area lying above *x*-axis and included between the circle $x^2 + y^2 = 2ax$ and the parabola $y^2 = ax$.

**OR**

Find the area of the region $\{(x, y): 0 \le y \le x^2; 0 \le y \le x + 2; 0 \le x \le 3\}$

28. A company sells two different products A and B. The two products are produced in a common reduction process which has a total capacity of 500 man hours. It takes 5 hours to produce a unit of A and 3 hours to produce a unit of B. The demand in the market shows that the maximum number of units of A that can be sold is 70 and that of B is 125.Profit on each unit of A is Rs.20 and on B is Rs. 15.How many units of A and B should be produced to maximize the profit. From an L.P.P. and solve it graphically.

29. Find the equation of the plane which contains the line of intersection of the planes $\vec{r}.(\hat{i}+2\hat{j}+3\hat{k})-4=0$ and $\vec{r}.(2\hat{i}+\hat{j}-\hat{k})+5=0$ and which is perpendicular to the plane $\vec{r}.(5\hat{i}+3\hat{j}-6\hat{k})+8=0$.