MOCK TEST (2014-2015)

Class XII

Mathematics

Series: SSO/01 **Code: 65/1/2/D**

Roll no.

General Instructions:

(i) All the questions are compulsory.

(ii) The question paper consists of 26 questions divided into three section A,B and C. Section A comprises of 6 questions of one mark each, section B comprises of 13 questions of four marks each and section C comprises of 7 questions of six marks each.

(iii) There is no overall choice. However, an internal choice has been provided in 3 questions of four marks each an in 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

SECTION-A

1 If * be a binary operation on the set of Z given by $a*b = a+3b^2$, *then find the value of* $2*4$.

2 Evaluate : $\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2)$.

3 If A is an invertible matrix of order 3 and |A|=5, then find | adj A |.

4 For what value of x is the following matrix singular:

$$\begin{bmatrix} x+1 & 3-2x \\ 4 & 2 \end{bmatrix}$$

5 If $\left|\left[\vec{a}\right]\right| = \sqrt{3}, |\vec{b}| = 2$ *and* $\vec{a}\,.\,\vec{b} = 3$, *find the angle between* $\vec{a}$ *and* $\vec{b}$.

6 Find the direction cosines of the line $\frac{x-5}{3} = \frac{2-y}{6} = \frac{2z-4}{4}$

SECTION B

7 Show that the relation R defined by (a,b) R (c, d)$\Rightarrow$ ad = bc on the set N x N is an equivalence relation.

8 Prove that: $\tan^{1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \frac{1}{2}\cos^{-1}\left(\frac{3}{5}\right)$

9 Using elementary transformation , find the inverse of $A = \begin{bmatrix} 3 & -1 \\ -4 & 1 \end{bmatrix}$

OR

If A = $\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find k so that $A^2 = kA$. *Hence find* A^{-1}

10 Find the values of a and b such that the function defined by

$$f(x)\begin{cases}5, if\ x\le 2\\ ax+b, if\ 2<x<10\\ 21, if\ x>10\end{cases}$$

11 Differentiate $(\sin x)^x+\sin^1\sqrt{x}$ with respect to x.

12 Differentiate the following function with respect to x.

$$\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)$$

OR

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

13 Using properties of determinants, prove that :

$$\begin{vmatrix} a^2 & bc & ac+c^2\\ a^2+ab & b^2 & ac\\ ab & b^2+bc & c^2\end{vmatrix}=4a^2b^2c^2$$

14 Show that the line $\frac{x}{a}+\frac{y}{b}=1$ *touches the curve* $y=be^{x/a}$ at the point where the curve cuts y-axis.

15 Evaluate: $\int\frac{\cos xdx}{(2+\sin x)(3+4\sin x)}$

16 Evaluate: $x^2\tan^{-1}xdx$

OR

Evaluate: $\int e^x\left[\frac{x^2+1}{(x+1)^2}\right]dx.$

17 If $\vec{a}=i+j+k$ *and* $\vec{b}=j\ \ k$, find a vector $\vec{c}$ such that $\vec{a}\ x\ \vec{b}$ and $\vec{a}.\vec{c}=3$.

18 Find the equation of plane passing through three points with position vectors $i+j\ \ 2k, 2i\ \ \ j+k$ and $i+2j+k$. Also, find co-ordinates of point of intersection of this plane and line $\vec{r}=3i\ \ \ j\ \ k+\lambda(2i\ \ 2j+k)$.

19 In a survey of 50 people, claimed that they never indulged in corruption, while the remaining claimed that they always spoke the truth. Two persons are selected at random from the group. Fine the probability distribution of number of selected people who claimed that they never indulged in corruption. What values have been discussed in this question.

SECTION C

20 An aeroplane can carry a maximum of 200 passengers. A profit of Rs. 1000/- is made on each first class ticket and a profit of Rs. 600/- is made on each second class ticket. The airline reserves at least 20 tickets to first class. However at least four times as many passengers prefer to travel by second class than by first class. Determine how many tickets of each type must be sold to maximize profit for the airline Form an L.P.P. and solve it graphically.

21 Find the area of the region in the first quadrant enclosed by the x-axis, the line y = x and the circle $x^2+y^2=32$

22 Using integration, find the area bounded by the lines $x+2y=2, y\ \ x=1\ \ and\ \ 2x+y=7.$

OR

$$Evaluate: \int \frac{1}{\sin\theta \sin 2\theta} d\theta.$$

23 Find the vector equation of the plane passing through the intersection of the planes $\vec{r}.(2i+2j-3k)=7,\ \vec{r}.(2i+5j+3k)=9$ and the point (2, 1, 3).

24 Show that a cylinder of a given volume which is open at the top has minimum total surface area, when its height is equal to the radius of its base.

OR

Prove that the surface area of a solid cuboid of square base and given volume is minimum when it cube.

25 Bag I contains 3 red and 4 black balls and bag II contains 4 red and 5 black balls. One ball is transferred from bag I to bag II and then a ball is drawn from bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

26 Two trusts A and B receive Rs. 7,000/- and Rs. 5500/-respectively form central government to award prizes to persons of a district in three fields agriculture, education and social service. Trust Awarded 10, 5 and 15 persons in the field of a agriculture, education and social service respectively while trust B awarded 15,10 and 5 persons respectively. If fall three prizes together amount to Rs. 600/-, then find the amount of each prize by matrix method. What field do you prefer most for award for development of society. Give reason.