Mock Test (2014-2015)
Class XII
Mathematics

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 Let * be a binary operation on the set of natural number N given by $a * b = LCM(a, b) \ \forall \ a, b \in N,$ then find the value of 4*30.

2 Evaluate : $\tan^{-1} \ 2\cos(2\sin^{-1}\frac{1}{2})$

3 If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 9 & 2 \\ 18 & 4 \end{vmatrix}$ then find x.

4 If A is a square matric of order 3 such that $|adj \ A| = 64. \ Find \ |A|$

5 For what value of $\lambda, \vec{a} = 2\hat{i} + 6\hat{j} - 10\hat{k} \ \ and \ \hat{b} = \hat{i} + 3\hat{j} - \lambda\hat{k}$ are parallel vectors?

6 Write the equation of line parallel to line $\frac{x-1}{2} = \frac{1-y}{3} = \frac{z-2}{4}$ and passes through point (0,0,-1).

SECTION B

7 Show that the relation R in the set Z of integers given by R={(a, b) : 2 divides |a-b|} is an equivalence relation.

8 Prove that : $2\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \tan^{-1}\left(\frac{31}{17}\right)$

OR

Solve for x: $2\tan^{-1}(\sin x) = \tan^{-1}(2\sec x), x \neq \frac{\pi}{2}$

9 Using properties of determinates, Prove that :

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

10 Let $f(x) = \begin{cases} \dfrac{1-\cos 4x}{x^2}, & x < 0 \\ k, & x = 0 \\ \dfrac{2x}{\sqrt{x+4}-2}, & x > 0 \end{cases}$

Then determine the value of k, so that f(x) is continuous at x=0.

11 If $(\cos x)^y = (\cos y)^{x,}$ Find $\dfrac{dy}{dx}$

12 If A = $\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y such that $A^2 + xI = yA.$ *Hence find* A^{-1}

Or

Using elementary operation, find the inverse of the matrix A=$\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$.

13 At what points will the tangent to the curve $y = 2x^3 - 15x^2 + 36x - 21$ be parallel to x-axis? Also, find the equation of tangents to the curve at these points.

14 Evaluate: $\dfrac{5x}{(x+1)(x^2+9)} dx$

15 Evaluate: $\int \dfrac{x\sin^{-1} x}{\sqrt{1-x^2}} dx.$

OR

Find: $\log(\log x) + \dfrac{1}{(\log x)^2} dx$

16 Find a unit vector perpendicular to each of the vectors $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$.

17 Find the distance of the point (6,5,9) from the plane determined by point A(3,-1,2), B (5,2,4) and C(-1,-1,6)

18 If $x^y = e^{(x-y)}$ then show that $\dfrac{dy}{dx} = \dfrac{\log x}{(1+\log x)^2}$

19 A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability distribution of number of successes.

20 Show that the semi vertical angle of the cone of maximum volume and of given slant height is $\tan^{-1}\sqrt{2}$.

Or

Give the sum of perimeter of a square and a circle. Show that the sum of their areas is least when the side of the square is equal to diameter of the circle.

21 Find the shortest distance between the lines whose vector equations are

$$\vec{r} = (\hat{i} + \hat{j}) + \lambda(2\hat{i} - \hat{j} + \hat{k}) \ and \ \hat{r} = (2\hat{i} + \hat{j} - \hat{k}) + \lambda(3\hat{i} - 5\hat{j} + 2\hat{k}).$$

22 Using integration find the area of the triangle ABC, co-ordinates of whose vertices are A (4,1), B(6,6) and C (8,4).

OR

Evaluate: $\int \sin x \ \sin 2x \sin 3x dx.$

23 Find the area enclosed by the parabola $y^2 = x$ and the line $y + x = 2$.

24 A co-operative society of farmers has 50 hectares of land to grow two crops A & B. The from crops A and B hectare as Rs. 10,500/- and Rs. 9000/- respectively. To control weeds, a liquid herbicide has to be used for crops A and B at the rate of 20 liters and 10 litres per hectare respectively. Further not more than 800 litres of herbicide should be used in order to protect fish and wildlife using a pond which collects drainage from this land. Keeping in mind that the protection of fish and other wildlife is more important than earning profit, how much land should be allocated to each crop so as to maximize the total profit? Form an LPP from the above and solve it graphically. Do you agree with the massage that the protection of wildlife is utmost necessary to preserve the balance in environment?

25 If $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & -1 & 0 \\ -7 & 2 & 1 \end{bmatrix}$

Find A^{-1} and hence solve that following system of equations:

$$2x + y + 3z = 3$$
$$4x - y = 3$$
$$-7x + 2y + z = 2$$

26 Of the students in school, it is known that 30% have 100% attendance and 70% students are irregular. Previous year results report that 70% of all students who have 100% attendance attain A grade and 10% irregular students attain A grade in their annual examination. At the end of the year, one student is chosen at random from the school and he has A grade. What is the probability that the students has 100% attendance?
(i) Write any two values reflected in this question.
(ii) Is regularity required only in school?