sns academy
a fingerprint school
*Sincerity, Nobility and Service*

**Class: XII** **MODEL EXAM-1-Nov-19-Mathematics** **Marks: 80**
**Date: 18.11.19** **Time: 3 hrs**

**General Instructions:**

(i) All the questions are compulsory.

(ii) The question paper consists of 36 questions divided into 4 sections A, B, C, and D.

(iii) Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.

(iv) There is no overall choice. However, an internal choice has been provided in three questions of 1 mark each, two questions of 2 marks each, two questions of 4 marks each, and two questions of 6 marks each. You have to attempt only one of the alternatives in all such questions.

(v) Use of calculators is not permitted.

## SECTION-A

**Choose the most suitable answer:**

1. The value of $\int_{-2}^{2}(x^3+x)dx$

   (a) 1/2 (b) 12 (c) 0 (d) 6

2. $\int_{1}^{e}\log x\,dx =$

   (a) 1 (b) e – 1 (c) e + 1 (d) 0

3. $\int_{0}^{2a} f(x)dx =$

   (a) $\int_{0}^{a} f(x)dx+\int_{0}^{a} f(a-x)$ (b) $\int_{0}^{a} f(x)dx+\int_{0}^{a} f(2a-x)$ (c) $\int_{0}^{a} f(x)dx+\int_{0}^{2a} f(a-x)$

   (d) $\int_{0}^{a} f(x)dx-\int_{0}^{a} f(a-x)$

4. The area bounded by the ellipse $\frac{x^2}{3^2}+\frac{y^2}{16}=1$ is

(a) $144\ \pi$ (b) $12\pi$ (c) $9\pi$ (d) $16\pi$

5. Write the order and degree of the differential equation $4\left(\frac{d^2y}{dx^2}\right)^2=\left(\frac{dy}{dx}\right)^{7/2}$ is

(a) 2, 1 (b) 2,2 (c) 2, 4 (d) 2, 5

6. Write the solution of the differential equation $(3x^2+1)\frac{dx}{dy}=x^3+x$ is

(a) $\log(3x^2+1)=y+c$ (b) $\log|x^3+x|=y+c$ (c) $\frac{x^3}{4}+x^2=c$ (d) none

7. The degree of the differential $\left(\frac{d^2y}{dx^2}\right)+\left(\frac{dy}{dx}\right)^2+\sin\left(\frac{dy}{dx}\right)+1=0$, is

(a) 3 (b)2 (c) 1 (d) not defined.

8. The number of arbitrary constants in the particular solution of a differential equation of third is

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

9. The integrating factor of the differential equation $x\frac{dy}{dx}-y=2x$, is

(a) $e^{-x}$ (b) $e^{-y}$ (c) 1/x (d) x

10. The vector $\cos\alpha\cos\beta\vec{i}+\cos\alpha\sin\beta\vec{j}+\sin\alpha\vec{k}$ is a

(a) null vector (b) unit vector (c) constant vector (d) none

11. Find the values of x and y so that the vectors $2\vec{i}+3\vec{j}$ *and* $x\vec{i}-y\vec{j}$ are equal.

12. ABCD is a parallelogram with AC and BD as diagonals. Then find $\overrightarrow{AC}-\overrightarrow{BD}$.

13. Find the projection of vector i + j + k on vector j .

14. If $\vec{a}$ and $\vec{b}$ represents the diagonals of a rhombus, then find $\vec{a}.\vec{b}$.

15. If a line makes an angle $\frac{\pi}{3},\frac{\pi}{4}$ with x-axis and y-axis respectively, then find the angle made by the line with z-axis.

16. The angle between the planes 2x – y + z = 6 and x + y + 2z = 3 is_____

17. The distance between the planes 2x+2y-z+2=0 and 4x+4y-2z+5=0 is___

18. The equation of the plane which cuts equal intercepts of unit length on the co-ordinates axes is ____

19. Find the intercepts of the plane 4x+2y-3z+24=0.

20. Write the unit normal to the plane x-3y+5z =7.

## SECTION-B

**Answer the following:**

21. Find the integral $\int (2x - \cos 4x)dx$. **(OR)**

Integrate $\int_{-\pi/2}^{\pi/2} \sin^3 x\, dx$.

22. Verify that the function $y = e^{-3x}$ is a solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0.$ **(OR)**

Find the integrating factor of the differential equation $x\frac{dy}{dx} + 2y = x^2.$

23. Find the direction cosines of the vector joining the points A(1, 2, -3) and B(-1,-2,1), directed from A to B.

24. If $\vec{a} = 5\hat{i} - \vec{j} - 3\vec{k}$ and $\vec{b} = \hat{i} + 3\vec{j} - 5\vec{k}$, then show that the vectors $\vec{a} + \vec{b}$ *and* $\vec{a} - \vec{b}$ are perpendicular.

25. Find the angle between the vectors $\hat{i} - 2\vec{j} + 3\vec{k}$ *and* $3\hat{i} - 2\vec{j} + \vec{k}$ (use dot product)

26. The Cartesian equation of a line is $\frac{x+3}{2} = \frac{y-5}{4} = \frac{z+6}{2}$. Find the vector equation of a line.

## SECTION-C

**Answer the following:**

27. Integrate : $\int \sqrt{\sin 2x}\cos 2x \; dx$ .

28. Find $\int \frac{3x-2}{(x+1)^2(x+3)}dx$ (OR) $\int e^x \sin x \, dx$ .

29. Find the area of the region bounded by the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$.

30. Show that the differential equation $(x-y)\frac{dy}{dx}=x+2y$ is homogeneous and solve it.

31. Find the shortest distance between the lines $\vec{r}=\hat{i}+\hat{j}+\lambda(2\hat{i}-\hat{j}+\hat{k})$ and $\vec{r}=2\hat{i}+\hat{j}-\hat{k}+\mu(3\hat{i}-5\hat{j}+2\hat{k})$.

32. Find the coordinates of the foot of the perpendicular drawn from the origin to the plane 2x – 3y + 4z – 6 = 0. (OR)
Find the equations of the planes that passes through three points (1, 1, -1), (6, 4, -5), (-4, -2, 3).

## SECTION-D

**Answer the following:**

33. Find the area lying above x-axis and included between the circle $x^2+y^2=8x$ and inside of the parabola $y^2=4x$. **(OR)**
Find the area of the region $\{(x,y): 0\le y\le x^2+1, 0\le y\le x+1, 0\le x\le 2\}$

34. Find the area bounded by the curves $y=x^3 \; and \; y=x$ .

35. In a bank, principal increases continuously at the rate of 5% per year. In how many years Rs.1000 double itself? **(OR)**
Solve: $\frac{dx}{dy}+y\cot x=2x+x^2\cot x \;\; (x\neq 0)$ given that y = 0 and $x=\frac{\pi}{2}$.

36. Find the equation of the plane which is perpendicular to the plane $5x+3y+6z+8=0$ and which contains the line of intersection of the planes $x+2y+3z-4=0 \; and \; 2x+y-z=-5$.