OM SAI INSITUTE

Subject : Mathematics **Class : XII Science**

Date : - **Marks:- 80**

Section A

Q.1) Write the Correct answer.(2 marks) **(16)**

1) The area of the region enclosed by the curve $y = \frac{1}{x}$, and the lines $x = e, x = e^2$ is given by

(A) 1 sq. unit (B) $\frac{1}{2}$ sq. unit (C) $\frac{3}{2}$ sq. units (D) $\frac{5}{2}$ sq. units

2) The volume of tetrahedron whose vertices are $(1, -6, 10)$, $(-1, -3, 7)$, $(5, -1, \lambda)$ and $(7, -4, 7)$ is 11 cu . units then the value of λ is

A) 7 B) $\frac{\pi}{3}$ C) 1 D) 5

3) If the p.d.f of a.c.r. X is $f(x) = \frac{x^2}{18}$ for $-3 < x < 3$ and $= 0$, otherwise then $P(|X| < 1) =$

(A) $\frac{1}{27}$ (B) $\frac{1}{28}$ (C) $\frac{1}{29}$ (D) $\frac{1}{26}$

4) If $p \wedge q$ is F, $p \to q$ is F then the truth values of p and q are

A) T, T B) T, F C) F, T D) F, F

5) If the mean and variance of a binomial distribution are 18 and 12 respectively, then $n = \cdots$

(A) 36 (B) 54 (C) 18 (D) 27

6) If the points $A(3,0,p), B(-1,q,3)$ and $C(-3,3,0)$ are collinear, then p=?

A) 9/2 B) 6 C) -5 D)None

7) If $A = \begin{bmatrix} 2 & -4 \\ 3 & 1 \end{bmatrix}$ then the adjoint of matrix A is

A) $\begin{bmatrix} -1 & 3 \\ -4 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 4 \\ -3 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 3 \\ 4 & -2 \end{bmatrix}$ D) $\begin{bmatrix} -1 & -3 \\ -4 & 2 \end{bmatrix}$

8) If polar co-ordinates of a point are $\left(2, \frac{\pi}{4}\right)$ then its cartesian co-ordinates are

a) $(2, \sqrt{2})$ c) (2,2) b) $(\sqrt{2}, 2)$ d) $(\sqrt{2}, \sqrt{2})$

Q.2) Write the answer.(1 marks) **(4)**

1) Write the negation of p → q

2) Find $\cos^{-1}\left(-\frac{1}{2}\right)$

3) Find the area of the region bounded by the following curves, X - axis and the given lines $y = 2x, x = 0, x = 5$

4) Find the joint equation of lines: $x + y - 3 = 0$ and $2x + y - 1 = 0$

Section B

Write the answer Any EIGHT .(2 marks) **(16)**

3) Find the area of the region bounded by the following curves, X - axis and the given lines $xy = 2, x = 1, x = 4$

4) Find the mean number of heads in three tosses of a fair coin.

5) Write the inverse and contrapositive of the statement "If it snows, then they do not drive the car"

6) If $E(X) = 5$ and $\text{Var}(X) = 2 \cdot 5$, find n and p.

7) Evaluate the following : $\tan^{-1}(1) + \cos^{-1}\left(\frac{1}{2}\right) + \sin^{-1}\left(\frac{1}{2}\right)$

8) Using truth tables prove the following logical equivalences. $\sim p \wedge q \equiv (p \vee q) \wedge \sim p$

9) SOLVE BY REDCUCTION METHOD $2x + 3y = -5, 3x + y = 3$

10) Find the graphical solution for the system of linear inequation

$$2x + 3y \leq 2, x - 2y \leq 1$$

11) Find k if The sum of the slopes of the lines given by $3x^2 + kxy - y^2 = 0$ is zero.

12) If slope of one of the lines given by $ax^2 + 2hxy + by^2 = 0$ is four times the other then show that $16h^2 = 25ab$.

13) Find the position vector of point R which divides the line joining the points P and Q whose position vectors are $2\hat{\imath} - \hat{\jmath} + 3\hat{k}$ and $-5\hat{\imath} + 2\hat{\jmath} - 5\hat{k}$ in the ratio 3: 2 internally

14) Find i) $\bar{u} \cdot \bar{v}$ if $|\vec{u}| = 2, |\vec{v}| = 5, |\bar{u} \times \bar{v}| = 8$

Section C

Write the answer Any EIGHT .(3 marks) **(24)**

15) Find the area of the region bounded $y^2 = 16x$ and $x = 0, x = 4$

16) Suppose error involved in making a certain measurement is continuous r.v. X with p.d.f. $f(x) = k(4 - x^2)$, for $-2 \leq x \leq 2$ and $= 0$ otherwise.
Compute : (i) $P(x > 0)$ (ii) $P(-1 < x < 1)$

17) Find the inverse of adjoint matrix of $\begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$

18) Minimize $z = 4x + 8y$ subjected to $2x + y \geq 7, 2x + 3y \geq 15, y \geq 2, x \geq 0, y \geq 0$

19) Find the shortest distance between the lines $\bar{r} = (4\hat{\imath} - \hat{\jmath}) + \lambda(\hat{\imath} + 2\hat{\jmath} - 3\hat{k})$ and

$$\bar{r} = (\hat{\imath} - \hat{\jmath} + 2\hat{k}) + \mu(\hat{\imath} + 4\hat{\jmath} - 5\hat{k})$$

20) A die is thrown 6 times. If "getting an odd number' is a saccess, find the probability of
(i) 5 successes (ii) at least 5 successes

21) Using truth table prove that $(p \wedge q) \to r \equiv p \to (q \to r)$

22) Show that equation $x^2 - 6xy + 5y^2 + 10x - 14y + 9 = 0$ represents a pair of lines. Find the acute angle between them. Also find the point of their intersection.

23) Prove that $[\bar{a} \quad \bar{b} + \bar{c} \quad \bar{a} + \bar{b} + \bar{c}] = 0$

24) Prove that, $\cos^{-1}\left(\frac{3}{5}\right) + \cos^{-1}\left(\frac{4}{5}\right) = \frac{\pi}{2}$

25) Find the volume of a tetrahedron whose vertices are
$A(-1,2,3) B(3,-2,1), C(2,1,3)$ and $D(-1,-2,4)$.

26) Find the angle between planes $\bar{r} \cdot (\hat{\imath} + \hat{\jmath} + 2\hat{k}) = 13$ and $\bar{r} \cdot (2\hat{\imath} - \hat{\jmath} + \hat{k}) = 31$.

Section D

Write the answer Any FIVE.(4 marks) **(20)**

27) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ by elementary Row transformations.

28) Without using truth table prove that : $(p \wedge q) \vee (\sim p \wedge q) \vee (p \wedge \sim q) \equiv p \vee q$

29) The probability that a bulb prodaced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 sach bulbs
(i) none (ii) not more than one (iii) more than one

30) Let the p.m.f. of r.v. X be $P(x) = \frac{3-x}{10}$, for $x = -1, 0, 1, 2$ Calculate $E(X)$ and $Var(X)$.

31) If $u = \hat{\imath} - 2\hat{\jmath} + \hat{k}, \bar{v} = 3\hat{\imath} + \hat{k}$ and $\bar{w} = \hat{\jmath} - \hat{k}$ are given vectors, then find $[\bar{u} + \bar{w}] \cdot [(\bar{w} \times \bar{u}) \times (\bar{v} \times \bar{w})]$

32) Minimize $z = 6x + 21y$ subject to $x + 2y \geq 3, x + 4y \geq 4, 3x + y \geq 3$, $x \geq 0, y \geq 0$ show that the minimum value of z occurs at more than two points

33) Find the area of the region included between: $y = x^2 + 3$ and the line $y = x + 3$

ALL THE BEST