SAMPLE PAPER-1

Class: XII **Max. Marks: 80**
Subject: Mathematics **Time: 3 Hour**

General instructions:

(i) The question paper contains two parts A and B.Each part is compulsory.Part A carries 24 marks and part B carries 56 marks .

(ii) Part A has objective type questions and Part B has descriptive type questions.

(iii) Both Part A and Part B have choices.

PART- A

1.It consists of two sections **–I and II**

2.Section **I** comprises of 16 very short answer type questions of one mark each **Internal choice is provided in five questions of section I**

3.Section **II** contains two case study.Each case study comprises of 5 case based MCQs. An examinee is to attempt **any 4 out of 5 MCQs.Each MCQ carries one mark.**

PART- B

1.It consists of three sections –III,IV,V.

2.Section III comprises of 10 questions of 2 marks each

3.Section IV comprises of 7 questions of 3 marks each.

4.Section V comprises of 3 question of 5 marks each

5.Internal choice is provided in three questions of section III ,two questions of section IV and three questions of section V.You have to attempt one of the alternatives in all such questions

PART A

SECTION I

(1) Check whether the function $f_{:R\to R}$ defined as f(x)=$|x|$ is one to one or not.

OR

How many one to one functions are there from set A to set B, n(A)=3 n(B)=2.

(2)Write the smallest equivalence relation on A where A={1,2}.

(3)A relation R in the set of real numbers R={(a,b):a^2=b} is a function or not. Justify.

OR

If A={1,2,3,4,5,6,7,8,9,10,11,12},Write the equivalence classes of relation R on set A defined as R={(a,b):a≡ $b(mod\ 2), a, b \in A$}.

(4)$[A]_{2\times3}$, $[B]_{m\times2}$ find m and order of matrix [AB] if matrix AB is defined.

(5)Find the value of A-A^T where A is 2×2 matrix whose elements are given by $a_{ij} \begin{cases} = 2, when\ i \neq j \\ = 0\ when\ , i = j \end{cases}$

OR

If A is a square matrix of order 3×3 and $|A|$=-4 ,find $|A\ adj\ A|$.

(6)A_{ij} is a cofactor of a_{ij},$|A|$=-7 find ,$(a_{21}A_{21} + a_{22}A_{22} + a_{23}A_{23})^2$.

(7)Find $\int e^x(cosec^2x + x - cot^2x)dx$.

OR

$\int_{-\pi/2}^{\pi/2} x^4 tan\ xdx$.

(8)Find the area bounded by y=$|x|, y = 1$

(9)Find the number of arbitrary constants in the general solution of $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^5 = 4$.

OR

If $\frac{dy}{dx}$=$\frac{x^2y-xy^n}{x^3-y^3}$ is a homogeneous differential equation, find the value of n

(10)Find the unit vector in direction opposite to $\vec{a} = 2\hat{\imath} - \hat{\jmath}$.

(11)Find the area of parallelogram whose diagonals are 2$\hat{\imath}, -3\hat{\jmath}$.

(12) Find the angle between vectors $\vec{a}, \vec{b}$ if $|\vec{a} - \vec{b}|$=$|\vec{a} + \vec{b}|$

(13)Find the direction cosines of Z axis.

(14)Find the coordinate of the point where $\frac{1-x}{1} = \frac{y}{2} = \frac{z}{3}$ intersects YZ plane .

(15) A and B are two independent events with P(A) = $\frac{3}{5}$ and P(B) = $\frac{4}{9}$, then find P(A'∩B')

(16.) Ten cards numbered 1 to 10 are placed in a box , mixed up thoroughly and then one card is drawn at random.If it is known that the number on the card is more than 3,then find the probability that it is an odd number .

SECTION II

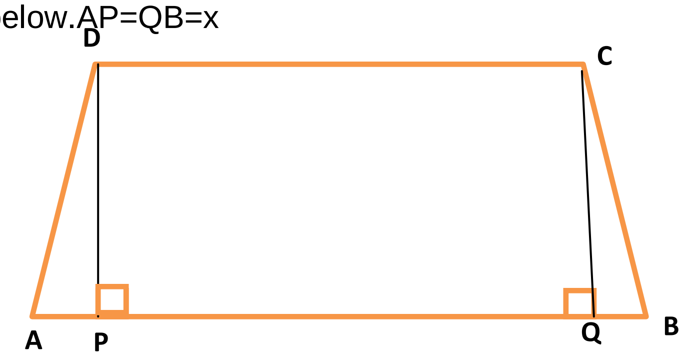
CASE STUDIES(Q17-Q18):Answer any four sub parts of the case study based question.Each question carries one mark.

PART B

17. Case study based –01

An architect designs a building for Multinational Company. The floor consist of a Trapezium region whose length of three sides other than base are equal to 10 cm as shown below.

An architect designs a building for Multinational Company. The floor consist of a Trapezium region whose length of three sides other than base(AB) are equal to 10 m as shown below.AP=QB=x



i) Area of trapezium is?

ii) The area of trapezium region 'A' expressed as a function of x is
   a. $(x+10)\sqrt{100+x^2}$
   b. $(x+10)\sqrt{100-x^2}$
   c. $(x-10)\sqrt{100+x^2}$
   d. $(x-10)\sqrt{100-x^2}$

iii) Area of Trapezium is maximum at x =
   a. 5
   b. 10
   c. -5
   d. -10

iv) The maximum value of Area 'A' is
   a. $25\sqrt{3}$
   b. $50\sqrt{3}$
   c. $75\sqrt{3}$
   d. $100\sqrt{3}$

If a function ‘f ’ is minimum then

e. $f''(x)=0$
f. $f''(x)>0$
g. $f''(x)<0$
h. none

18. In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%,35% and 40% of the bolts. Of their outputs 5,4 and 2 percent are respectively defective bolts.

(i)The above events are

(a) Mutually exclusive (b) mutually exhaustive (c) both (d) none

ii) The probability of bolt manufactured by machine A is

(a) 0.25 (b) 0.35 (c) 0.45 (d) 0.40

(iii) The probability that the bolt drawn is defective given that it is manufactured

by machine C is

(a) 0.20 (b) 0.02 (c) 0.05 (d) 0.04

(iv)The probability that the bolt drawn is defective given that it is manufactured

by machine B is

(a) 0.05 (b) 0.22 (c) 0.04 (d) 0.3

(v) A bolt is drawn at random from the product and is found to be defective. What is the

probability that it is manufactured by the machine B?

(a) $\frac{28}{69}$ (b) $\frac{41}{69}$ (c)$\frac{38}{69}$ (d) $\frac{31}{69}$

SECTION III

19. Find the value of $tan^2 \frac{1}{2} sin^{-1} \frac{2}{3}$

20. If A= $\begin{bmatrix} p & 2 \\ 2 & p \end{bmatrix}$ $and\ |A^3| = 125, \text{then find the value of p.}$

OR

If $\begin{bmatrix} 1 & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ -1 \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}, \text{find } x + y + z$

21. For what value of k is the following function continuous at x = $\frac{-\pi}{6}$?

$$f(x) = \begin{cases} \frac{\sqrt{3}\,sinx+cosx}{x+\frac{\pi}{6}}, x \neq \frac{-\pi}{6} \\ k, x = \frac{-\pi}{6} \end{cases}$$

22. Find the point on the curve , where normal to the curve $x^2 = 4y$ passes through the point (1,2).

23. Find $\int \frac{\boldsymbol{dx}}{\boldsymbol{cos^2x\sqrt{tan^2x+4}}}$

OR

$\int_{-\pi}^{\pi}(1-x^2)sinxcos^2x\,dx$

24. Find the area bounded by the curve y = sin x between x = 0 and x =2 π.

25. Find the solution of $\frac{dy}{dx} = 2^{y-x}$

26. If $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ *and* $|\vec{a}|=3, |\vec{b}|=5, |\vec{c}|=7$, then find he value of

$\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$

27. Find the vector equation of the line passing through the point A(1,2,-1) and parallel to the line 5x-25=14-7y=35z

28. The probability distribution of the discrete random variable X is given as :

X	**2**	**3**	**4**	**5**
P(X)	$\frac{5}{k}$	$\frac{7}{k}$	$\frac{9}{k}$	$\frac{11}{k}$

(i) Find the value of k

(ii)Find P(X≥ 4)

OR

If $P(A)=\frac{2}{5}, P(B)=\frac{1}{3}, P(A\cap B)=\frac{1}{5}$ *then find the value of* $P(\frac{\bar{A}}{\bar{B}})$

SECTION IV

29. Show that the relation R on the set A=$\{x \in Z: 0 \le x \le 12\}$, *given by* $R = \{(a,b): |a-b|$ *is a multiple of* $4\}$ is an equivalence relation. Find the equivalence classes related to 1 and 3 respectively.

30. If $y = x^{\sin x} + (\sin x)^{\cos x}$ then find the derivative of y with respect to x

31. If x $\sqrt{y+1}$ + y $\sqrt{x+1}$ = 0 (-1 < x < 1), prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

(OR)

Show that the function $f(x) = |x - 3|, x \in R$, is continuous but not differrentiable at $x = 3$.

32. Find the intervals in which the function f given by f(x) = $\sin x + \cos x$, $0 < x < 2\pi$, is strictly increasing or strictly decreasing.

33. .Evaluate $\int \frac{x^2}{(x^4+x^2-2)} dx$

34. Using integration, find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$

OR

A farmer has a field of shape bounded by $x=y^2$ and x=3.He wants to divide this into two parts of equal areas by a straight line x=c.Find the value of c.

35. Solve the differential equation $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$

SECTION V

36. Using matrices, solve the system of equations 3x -2y + 3z = 8,2x +y -z = 1,

4 x -3y +2z =4.

(OR)

Determine the product $\begin{pmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{pmatrix} \begin{pmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{pmatrix}$ and use it to solve the

system of equations: x – y + z = 4, x – 2y – 2z = 9, 2x + y +3z = 1.

37. Find the foot of the perpendicular from P(1,2,-3) to the line $\frac{x+1}{2} = \frac{y-3}{-2} = \frac{z}{-1}$ .Also

find the image of P in the given line.

(OR)

Find the vector and Cartesian forms of equation of the plane passing through the point (1,2,-4) and parallel to the lines $\vec{r} = (\hat{\imath} + 2\hat{\jmath} - 4\hat{k}) + \lambda(2\hat{\imath} + 3\hat{\jmath} + 6\hat{k})$ and $\vec{r} = (\hat{\imath} - 3\hat{\jmath} + 5\hat{k}) + \mu(\hat{\imath} + \hat{\jmath} - \hat{k})$. Also find the distance of the point (9,-8,-10) from the plane thus obtained.

38. Minimize and maximize Z = 5x + 2y subject to the following constrains:

x-2y ≤ 2, 3x + 2y≤ 12, -3x + 2y≤ 3, x≥ 0, y≥ 0.

(OR)

Minimize and maximize Z = x + 2y subject to the following constraints:

x + 2y ≥ 100, 2x- y ≤ 0, 2x + y≤ 200, x≥ 0, y≥ 0.