

# MODEL QUESTION PAPER - 1

## I PU MATHEMATICS

### PART-A

Answer All the Multiple choice Questions:

10×1=10

- Let  $A=\{1,2,3,4,5,6,7,8,9,10\}$  and  $B = \{2,3,5,7\}$  then  $A \cap B =$   
A) A                      B) B                      c)  $\emptyset$                       D) U
- If  $(x + 1, y - 2) = (3,1)$  then  $(x,y)$  is  
A)  $(-1,-3)$               B) $(1,3)$                       C) $(2, 3)$                       D) $(-3,-2)$
- The range of  $\sin x$  is  
A) $(-1,1)$                       B) $[-1,1)$                       C) $[-1,1]$                       D) $(-1,1]$
- The conjugate of  $z = -1 - i$  is  
A) $1 + i$                       B) $1 - i$                       C) $-i + 1$                       D) $-1 + i$
- If  ${}^nC_2 = {}^nC_8$ , then  ${}^nC_2$  is  
A) 45                      B)90                      C)15                      D)28
- If  $a_n=2n+5$  then  $a_3 - a_2$  is  
A)4                      B)2                      C)11                      D)9
- Slope of a line passing through two points  $(-2,6)$  and  $(4, 8)$  is  
A) $\frac{1}{3}$                       B)3                      C) $-3$                       D) $-\frac{1}{3}$
- $\lim_{x \rightarrow 3} x + 3 =$   
A)0                      B)6                      C)3                      D)-3
- If the statements P and Q is true then  
A)Only P is true                      B)Only Q is true  
C)Both P and Q are true                      D)Both P and Q are not true
- If  $\frac{2}{11}$  is the probability of an event, then the probability of 'Not A' is  
A) $\frac{11}{2}$                       B) $\frac{11}{9}$                       C) $\frac{9}{11}$                       D)0

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket..(2, 3, 6, 8, 16,) 5X1=5

- If A has 4 elements, then  $P(A)$  have ..... elements.
- The number of terms in the expansion of  $(3 + x)^5$  is.....
- The point  $(-2,1,3)$  lie in ....<sup>th</sup> octant.
- X-intercept of the line  $\frac{x}{3} + \frac{y}{2} = 1$  is .....
- The derivative of  $f(x)=x^2 - 1$  at  $x = 4$  is.....

III. Answer All the following Questions

5X1=5

- Write the subsets of a set  $\{1,2\}$
- Solve  $3x - 7 < 5 + x$ , when  $x$  is a natural number.
- Convert  $240^\circ$  into radian measure.
- Evaluate  $\frac{n!}{(n-r)!}$ , when  $n=6$ ,  $r=2$ .
- Find the median of the data 2,9,9,3,6,9,4,6.

## PART-B

### Answer Any Nine Questions:

**9×2=18**

21. If the universal set  $U = \{1, 2, 3, 4, 5, 6, 7\}$ ,  $A = \{1, 2, 3, 4\}$ ,  $B = \{3, 4, 5, 6\}$ . Verify  $(A \cup B)' = A' \cap B'$
22. In a class of 35 students, 24 likes to play cricket, 5 likes to play both cricket and football. Find how many students like to play football?
23. If  $f(x) = x^2$  and  $g(x) = 2x + 1$  are two real functions then find  $(f + g)(x)$  and  $(f \cdot g)(x)$
24. A minute hand of a clock is 1.5cm long. How far does its tip move in 40 Minute? (use  $\pi = 3.142$ )
25. Prove that  $\sin 3x = 3\sin x - 4\sin^3 x$ .
26. If  $x + iy = \frac{p + iq}{p - iq}$  then prove that  $x^2 + y^2 = 1$
27. Solve  $3x - 2 < 2x + 1$  and show the graph of the solution on number line.
28. Find the equation of line passing through  $(-1, 1)$  and  $(2, -4)$
29. In a triangle ABC with vertices  $A(2, 3)$ ,  $B(4, -1)$  and  $C(1, 2)$ . Find the length of altitude from the vertex A.
30. Find the ratio in which the line segment joining the points  $(4, 8, 10)$  and  $(6, 10, -8)$  is divided by YZ-plane.
31. Evaluate:  $\lim_{x \rightarrow 0} \frac{ax + x \cos x}{b \sin x}$
32. Write the Contrapositive and Converse of "If a parallelogram is a square, then it is a rhombus".
33. The coefficient of variation and standard deviation are 60 and 21 respectively. What is the arithmetic mean of the distribution.
34. A card is selected from a pack of 52 cards. Calculate the probability that the card is  
i) an Ace  
ii) a black card.

## PART-C

### Answer Any Nine Questions:

**9×3=27**

35. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple and orange juices. Find how many students were taking neither apple juice nor orange juice.
36. Let  $R: Z \rightarrow Z$  be a relation defined by  $R = \{(a, b): a, b \in Z, a - b \in Z\}$ . Show that
  - i)  $\forall a \in Z, (a, a) \in R$
  - ii)  $(a, b) \in R \Rightarrow (b, a) \in R$
  - iii)  $(a, b) \in R, (b, c) \in R \Rightarrow (a, c) \in R$
37. Prove that  $(\cos x + \cos y)^2 + (\sin x + \sin y)^2 = 4 \cos^2 \left( \frac{x - y}{2} \right)$
38. Solve the equation  $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0$
39. Express  $\frac{1 - i}{1 + i}$  into polar form
40. How many words with or without meaning can be made from the letters of the word "MONDAY", assuming that no letter is repeated if
  - i) 4 letters are used at a time,

- ii) all letters are used at a time,
  - iii) all letters are used but first letter is a vowel.
41. The coefficient of three consecutive terms in the expansion of  $(1+a)^n$  are in the ratio 1:7:42 .Find n.
42. Insert 3 arithmetic means between 8 and 24.
43. If the  $p^{th}, q^{th}, r^{th}$  terms of a G.P. are  $a, b, c$  respectively .Prove that  $a^{q-r} . b^{r-p} . c^{p-q} = 1$
44. Find the equation of the ellipse whose center at origin ,major axis on the X axis and passes through the point (4, 3) and (6 ,2)
45. Find the derivative of the function ‘cos x’ with respect to ‘x’ from the first principle.
46. Verify by the method of contradiction that  $\sqrt{2}$  is irrational.
47. A letter is chosen at random from the word ‘ASSASSINATION’ , Find the probability that the letter is (i) an vowel (ii)consonant
48. Two students Anil and Sunil appear in an examination. The probability that Anil will qualify in the examination is 0.05 and that Sunil will qualify is 0.10. The probability that both will qualify the examination is 0.02. Find the probability that Anil and Sunil will not qualify in the examination.

**PART-D**

**Answer Any Five Questions:**

**5×5=25**

49. Define modulus function. Draw the graph of modulus function. Write the domain and range of the function.
50. Prove that  $\frac{\sin 9x + \sin 7x + \sin 3x + \sin 5x}{\cos 9x + \cos 7x + \cos 3x + \cos 5x} = \tan 6x$
51. Prove by mathematical induction that  $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \dots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4} \forall n \in N$
52. Solve graphically  $5x + 4y \leq 40, x \geq 2, y \geq 3;$
53. A group consists of 4 girls and 7 boys, In how many ways can a team of 5 members be selected if the team has
- i) No girl
  - ii) At least one boy and one girl
  - iii) At least three girls
54. State and prove Binomial Theorem for all natural numbers.
55. Derive a formula for the perpendicular distance of a point  $(x_1, y_1)$  from the line  $Ax + By + C = 0$
56. Derive an expression for the coordinates of a point that divides the line joining the points  $A(x_1, y_1, z_1)$  and  $B(x_2, y_2, z_2)$  internally in the ratio  $m:n$  .Hence ,find the coordinates of the midpoint of AB where  $A=(2, -3, 4)$  and  $B=(-1 ,2, 1)$
57. Prove that  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$  ( $x$  being in radians) and hence evaluate  $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$
58. Find the mean deviation about the mean for the following data

Marks Obtained	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of Students	2	3	8	14	8	3	2

**PART-E**

**Answer the following Questions:**

59. Prove geometrically that  $\cos(A + B) = \cos A \cdot \cos B - \sin A \cdot \sin B$  and hence prove that  $\cos 2A = \cos^2 A - \sin^2 A$

OR

Define hyperbola as a set of points in the plane. Derive its equation in the form

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1.$$

(6)

60. Find the sum of n terms of the series  $5+11+19+29+\dots$

OR

Find the derivative of  $\frac{2}{x+1} - \frac{x^2}{3x-1}$

(4)

\*\*\*\*\*GOOD LUCK\*\*\*\*\*

