BS

# I P.U.C. ANNUAL EXAMINATION-2018

I

Time : 3.15 Hours | MATHEMATICS - 35 | Max. Marks : 100

**Instructions:**

i) The question paper consists of five parts. A, B, C, D and E. Answer all the parts.

ii) Use the graph sheet for the question on linear inequality in Part - D.

## PART - A

**I Answer ALL the questions.** **10×1=10**

1) Define power set of a set.
2) If (x+1, y-2) = (3, 1). find the values of x and y.
3) Convert 240° into radian measure.
4) Find the multiplicative inverse of $2-3i$.
5) Compute $\frac{12!}{10!2!}$
6) Find the 17th term of the sequence whose $n^{th}$ term is $a_n = 4n - 3$.
7) Find the slope of the line joining the points (3, –2) and (–1, 4).
8) Evaluate $\lim_{x\to 0}\frac{ax+b}{cx+1}$
9) Write the negation of the statement '$\sqrt{2}$ is not a complex number'.
10) A coin is tossed and a die is thrown. Write the sample space.

## PART - B

**II Answer any TEN questions.** **10×2=20**

11) If A = {3, 5, 7, 9, 11} B = {7, 9, 11, 13} C = {11, 13, 15} find A∩(B∪C).
12) If S and T are two sets such that S has 21 elements, T has 32 elements and S∩T has 11 elements, how many elements does SUT have?
13) Let A = {1, 2}, B = {3, 4}. Write A×B. How many subsets will A×B have?
14) Find the value of sin 75°.
15) Find the general solution of $2\sin x + \sqrt{3} = 0$.
16) Express $\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+i\sqrt{2})-(\sqrt{3}-i\sqrt{2})}$ in the form a + ib.
17) Solve $7x + 3 < 5x + 9$ and show the graph of the solution on the number line.
18) Derive the equation of the straight line passing through the point $(x_1, y_1)$ and having the slope 'm'.
19) Reduce the equation 3x+2y–12=0 into intercept form and find its intercepts on the axes.
20) Show that the points A (–2, 3, 5), B (1, 2, 3) and C (7, 0, –1) are collinear.
21) Evaluate $\lim_{x\to 1}\frac{x^{15}-1}{x^{10}-1}$.
22) Write the converse and contrapositive of 'If a number is divisible by 9 then it is divisible by 3'.
23) An analysis of monthly wages paid to workers in two firms A and B belonging to the same industry gives the following results.

| | Firm A | Firm B |
|---|---|---|
| No. of wage earners | 586 | 648 |
| Mean of monthly wages | Rs. 5253 | Rs. 5253 |
| Variance of distribution of wages | 100 | 121 |

i) Which firm A or B pays larger amount as monthly wages?

ii) Which firm A or B shows greater variability in individual wages?

(P.T.O.)

24) If A and B are events such that P(A) = 0.42, P(B) = 0.48 and P (A∩B) = 0.16. Determine
(i) P (not A) (ii) P (A or B).

## PART - C

**III Answer any TEN questions.** **10×3=30**

25) In a survey of 600 students in a school, 150 students were found to be taking tea, 225 taking coffee and 100 were taking both tea and coffee. How many students were taking neither tea nor coffee.

26) Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by R = {(a, b) : a, b ∈ A, b is exactly divisible by a}
i) Write R in roster form.
ii) Find the domain of R.
iii) Find the range of R.

27) Prove that $\cos 3x = 4\cos^3 x - 3\cos x$.

28) Represent the complex number $Z = \frac{1}{1+i}$ in the polar form.

29) Solve $\sqrt{5}x^2 + x + \sqrt{5} = 0$.

30) Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements.
i) do the words start with P.
ii) do all the vowels always occur together.

31) Find the middle term in the expansion of $\left(\frac{x}{3} + 9y\right)^{10}$

32) Insert five numbers between 8 and 26 such that the resulting sequence is an A.P.

33) Find the sum of the sequence 7, 77, 777, ..... to n terms.

34) Find the equation of the parabola which is symmetric about y - axis and posses through the point (2, –3).

35) Find the derivative of tan x w.r.t. x from first principle.

36) Verify by the method of contradiction that "$\sqrt{7}$ is irrational".

37) A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that it will be
i) red ii) not blue iii) either red or blue.

38) A die is thrown. Find the probability of the following events.
i) A prime number will appear.
ii) A number greater than or equal to 3 will appear.
iii) A number less than 6 will appear.

## PART - D

**IV Answer any six questions.** **6×5=30**

39) Define modulus function. Draw the graph of modulus function. Write down its domain and range.

40) Prove that $\frac{(\sin 7x + \sin 5x) + (\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x) + (\cos 9x + \cos 3x)} = \tan 6x$.

41) Prove by using the principle of mathematical induction that $1^2 + 2^2 + 3^2 + ----+n^2 = \frac{n(n+1)(2n+1)}{6} \forall n \in N$.

42) Solve the following system of inequalities graphically $x + 2y \le 8, 2x + y \le 8, x \ge 0, y \ge 0$.

43) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these
i) four cards are of same suit.
ii) are face cards.
iii) two are red cards and two are black cards.
iv) four cards are of same colour.

44) State and prove Binomial theorem for any positive integer 'n'.

45) Derive the formula to find the distance of the point $(x_1, y_1)$ from the line $Ax + By + C = 0$.

46) Find the coordinates of the point R(x, y, z) dividing the line segment joining the points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, Z_2)$ internally in the ratio m:n.

47) Prove geometrically that $\lim_{x\to 0}\frac{\sin x}{x} = 1$ where x is measured in radians. Hence evaluate $\lim_{x\to 0}\frac{\tan x}{x}$.

48) Find the mean deviation about median for the following data.

| Class | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
|---|---|---|---|---|---|---|
| Frequences | 6 | 7 | 15 | 16 | 4 | 2 |

## PART - E

**V Answer any ONE question:** **1×10=10**

49) a) Prove geometrically that $\cos(x+y) = \cos x \cos y - \sin x \sin y$ and hence prove that $\cos\left(\frac{\pi}{2}+x\right) = -\sin x$ 6

b) Find the sum to n terms of the series $1\times2\times3 + 2\times3\times4 + 3\times4\times5 + ----$ 4

50) a) Define hyperbola. Derive its equation in the form $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ 6

b) find the derivative of $f(x) = \frac{x+\cos x}{\tan x}$ w.r.t.x. 4