JAIN COLLEGE

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Date: 2019-20220   **SUBJECT: MATHEMATICS**

I PUC
MOCK I

Timings Allowed: 3Hrs 15Mins   *Total Marks: 100*

Instructions:
1. **The question paper has five parts namely A, B, C, D and E. Answer all the parts.**
2. **Use the graph sheet for the question on inequalities in PART-D.**

PART - A

I. Answer ALL the questions.   **10 x   1 = 10 Marks**

1. Given that the number of subsets of a set A is 16. Find the number of elements in A.

2. If (x −1, y + 3) = (2, x+4), Find the values of x and y.

3. Convert $\frac{7\pi^c}{6}$ into degree measure.

4. Solve 7x+3 < 5x+9, x ∈ N.

5. Find 'n' if $n_{C_7} = n_{C_6}$.

6. Find the 20th term of the sequence $\frac{5}{2}, \frac{5}{4}, \frac{5}{8} \dots \dots \dots$

7. Find the slope and y intercept of 3x+4y-10=0.

8. Evaluate $\lim_{x \to 0} \frac{(x+5)^5 - 1}{x}$.

9. Write the negation of the statement   "Intersection of two disjoint sets is not an empty set".

10. Two series A and B with equal means have standard deviations 9 and 10 respectively. Which series is more consistent?

PART B

II. Answer any 10 of the following questions: **10 x 2   = 20 Marks**

11. If U = {x : x ≤ 10,x ∈ N}, A ={x : x ∈ N and x is prime}, B = {x : x ∈ N, x is even}. Find A ∩ B in roster form.

12. If A×B = {(a,1), (a,2), (a,3), (b,1), (b,2), (b,3)}, find the sets A and B and hence find B×A.

13. Let f (x) = $\sqrt{x}$ and g (x) = x   find   **(i)** (f + g) x and **(ii)** fg (x) .

14. A wheel makes 360 revolutions in one minutes through how many radians does it turn in 1 second.

15. If SinA = $\frac{3}{5}$ and A is in First quadrant then find Sin2A.

16. Express $i^{18} + \left(\frac{1}{i}\right)^{25}$ in the form of a + ib.

17. Solve 3x-2 < 2x+1 and represent the solution graphically on the number line.

18. In triangle ABC with vertices A (2, 3) , B (4 , -1) and C (1, 2), find the length of the altitude from the vertex A .

19. Find the angle between the lines y - $\sqrt{3}$ x-5=0 and $\sqrt{3}$ y −x+6=0.

20. Show that the points P (-2, 3, 5)   Q (1, 2 , 3) and R (7, 0 , -1) are collinear.

21. Evaluate $\lim_{x \to 3} \frac{x-3}{x^2 - 5x + 6}$.

22. Write the converse and contrapositive of " If a parallelogram is a square, then it is a rhombus. "

23. The co-efficient of variation and SD are 60 and 21 respectively. What is the arithmetic mean of the distribution?

24. Given P(A) = $\frac{3}{5}$ and P(B) = $\frac{1}{5}$. Find P(A or B). If A and B are mutually exclusive events.

PART C

III. Answer any 10 of the following: **10 X 3 = 30 Marks**

25. Let A = { 1, 2, 3, 4, ………….. 14 } Define a relation R from A to A   by R = { (x, y) : 3x − y = 0, x , y ∈ A }. Write its, relation 'R' in roster form, write its Domain and Range.

26. In a group of 200 students (who know at least one language), 100 students know English, 80 students know Kannada, 70 students know Hindi. If 40 students know all the three languages, find the number of students who know exactly two languages.

27. Solve sin2x - sin4x + sin6x =0.

28. Express $\frac{-1+i}{\sqrt{2}}$ in the polar form.

29. Solve the equation $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$.

30. In how many ways can the letters of the word **PERMUTATIONS** be arranged if the
1) words start with **P** and end with **S**, 2) vowels are all together, 3) there are always 4 letters between **P** and **S**?

31. Find $(a+b)^4 - (a-b)^4$. Hence evaluate $(\sqrt{3}+\sqrt{2})^4 - (\sqrt{3}-\sqrt{2})^4$

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

33. The sum of the first three terms of a GP is $\frac{39}{10}$ and their product is 1. Find the common ratio and the terms.

34. Find the eccentricity and length of the latus rectum of the hyperbola $4x^2 - 9y^2 = 36$.

35. Find the derivative of " cosx " with respect to x from first principles.

36. Verify by the method of contradiction that " $\sqrt{5}$ is irrational "

37. A committee of two persons is selected from two men and two women. What is the probability that the committee will have   a) no man   b) one man and   c) two men

38. If E and F two events such that P (E) = $\frac{1}{4}$, P (F) = $\frac{1}{2}$ and P (E and F) = $\frac{1}{8}$. Find P (not E and not F)

PART D

IV. Answer any SIX of the following :   **6 x 5 = 30 Marks**

39. Define signum function. Draw the graph of it and write down its domain and Range.

40. Prove by Mathematical Induction that $1^2 + 2^2 + 3^2 + \dots\dots\dots\dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

41. Prove that $\frac{Cos4x + Cos3x + Cos2x}{Sin4x + Sin3x + Sin2x}$ = Cot3x.

42. Solve graphically the system of Linear Inequalities $4x + 3y \le 60$, $y \ge 2x$, $x \ge 3$ and x , y ≥ 0

43. 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 (a) no girl (b) at least one boy and one girl and (c) at least three girls.

44. State and Prove Binomial Theorem for positive integer index 'n'.

45. Derive the formula for the perpendicular distance of a point (x_1 , y_1) from the line Ax + By + C =0

46. Derive an expression for the Co –ordinates 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 and hence find the midpoint of (1,2,3) and (5,6,7).

47. Prove that $\lim_{\theta\to 0} \frac{Sin\,\theta}{\theta}$ = 1(θ is measured in radian) and hence evaluate $\lim_{\theta\to 0} \frac{Sin a\,\theta}{Sin b\theta}$.

48. 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

V. Answer any one of the following: **10 X 1 = 10 Marks**

49   a) Prove geometrically that Cos (x + y) = cosx cosy - sinx siny .

      b) Find the sum of n terms of the series 5+11+19+29+41+……….

50   a) Define Ellipse. Derive its equation of the same in the standard form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (a > b)

      b) If y $= \frac{x^2 - cosx}{sinx}$, find $\frac{dy}{dx}$.

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