JAIN COLLEGE

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Date: / /2018 ***SUBJECT: MATHEMATICS***

I PUC
MOCK I

Timings Allowed: 3Hrs 15Mins

Total Marks: 100

Instructions :

(i) The question paper has five parts namely A, B, C, D and E. Answer all the parts.

PART - A

I. Answer all the following questions **10 x 1 = 10 Marks**

1. Define the power set of a set

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

3. Convert 315^0 into radian measure.

4. Find the multiplicative inverse of $\sqrt{5}$ + 3i

5. Find 'n' if $n_{c_9} = n_{c_8}$

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

7. Reduce the equation 3x + 2y – 12 = 0 into intercept form.

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

9. Write the negation of " The number 2 is greater than 7 "

10. A letter is chosen at random from the word " ENGINEERING " . Find the probability that the letter is a vowel.

PART B

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

11. If X and Y are two sets such that X ∪ Y has 18 elements and Y itself has 15 elements while X has 8 elements. How many elements does X ∩ Y have?

12. If A = { -1, 1} find A X A X A

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

14. Find the angle in radians through which a pendulum swings if its length is 75 cms and the tip describes an arc of length 10 cms.

15. Find the value of Cos 15^0

16. Express $\left(\frac{1}{3}+3i\right)^3$ in the form of a + ib.

17. Solve the inequality $3(1-x) < 2(x+4)$ and represent the solution graphically

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 distance between the lines $3x + 4y + 5 = 0$ and $6x + 8y + 2 = 0$

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

21. Evaluate $\lim_{x \to 1} \frac{x^{15}-1}{x^{10}-1}$

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

23. If the co-efficient of variation and SD are 60 and 21 respectively, find the arithmetic mean ?

24. If A and B are events such that P (A) = 0.42 P (B) = 0. 48 and P (A and B) = 0.16 find

P (A or B)

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) : $3x - y = o$ and { x , y $\in A$ } Write the domain and range.

26. In a group of 600 students in a school, 150 students were found to be taking tea and 225 taking coffee. Also 100 were taking both tea and coffee. Find how many students were taking neither coffee nor tea.

27. Prove that $\frac{4\,tanx\,(1-tan^2x)}{1-6tan^2x+tan^4x}$ = tan 4x

28. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into the polar form .

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

30. In how many distinct permutations of the letters of the word " MISSISSIPPI " do the 4 I's not come together ?

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

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 " sin x " with respect to x from first principles.

36. Verify by the method of contradiction that " $\sqrt{7}$ 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 6 of the following : **6 x 5 = 30 Marks**

39. Prove that $\lim_{x\to 0} \frac{\sin x}{x}$ = 1 (x being in radians) and hence evaluate $\lim_{x\to 0} \frac{tanx}{x}$

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

41. Define Modulus function, draw the graph of it and write its domain and range.

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

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.

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

47. Prove that $\frac{cos4x+\cos 3x+\cos 2x}{\sin 4x+\sin 3x+\sin 2x}$ = cot 3x

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 . Hence find sin 75^0

b) Find the sum to ' n " terms of the series $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2)$ ……..

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

b) If y = $\frac{\sin x + \cos x}{sinx - \cos x}$, find $\frac{dy}{dx}$

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