Date: Dec 2017   **i PUC**   **SUBJECT: Mathematics**

MOCK -I

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

PART- A

Answer all TEN questions.   **10X1=10**

1. Given that number of subsets of a set A is 16. Find the number of elements.
2. If (x.-1, y+3)= (2,x+4) find the value of x and y.
3. What is the value of $Cos\left(\frac{\pi}{4}-x\right)Cos\left(\frac{\pi}{4}-y\right)-Sin\left(\frac{\pi}{4}-x\right)Sin\left(\frac{\pi}{4}-y\right)$
4. Find the modulus of $\frac{1+i}{1-i}$
5. Find n if $nC_7 = nC_6$
6. Find the equation of the line passing through (-4,3) and with slope $\frac{1}{2}$
7. Write the first three terms of the sequence $a_n = (-1)^{n-1}5^{n+1}$
8. Evaluate $\lim_{x\to 0}\frac{(x+1)^5-1}{x}$
9. Write the contrapositive of " If a number is divisible by 9 is also divisible by3"
10. Write the mean of the given data 6, 7, 10, 12, 13, 4, and 8.

PART-B

Answer any TEN questions   **10X2=20**

11. If $U = \{x: x \le 10, x\epsilon N\}$ $A = \{x: x\epsilon N, x \text{ is prime}\}$ $B = \{x: x \text{ is even}, x\epsilon N\}$ find $(A\cap B')$
12. If A and B are two disjoint sets and n(A)=15, n(B)=10

    find $n(A\cup B)$ and $n(A\cap B)$
13. If $f:Z\to Z$ is a linear function defined by $f = \{(1,1)(0,-1)(2,3)\}$

    find f(x).
14. The minute hand of a clock is 2.1cm long. How far does its tip moves in 20 minute.
15. The difference between two acute angles of a right angled triangle is $\frac{3\pi}{10}$. Find the angles in degrees.
16. Express $1 + i\sqrt{3}$ in the polar form.
17. Solve $3x - 2 < 2x + 1$ and show graphically.
18. In a 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. If the origin is the centroid of the triangle PQR with P(2a, 4,6), Q(-4, 3b,-10)

    R(8, 14, 2c). Find the values of a,b and c.
20. Find the ratio in which the yz-plane divides the line segment joining the points (-2, 4, 7) and (3,-5, 8).

21. Evaluate $\lim_{x \to 3} \frac{x-3}{x^2-5x+6}$
22. Write the contrapositive and converse of the statement " If x is a prime number then x is odd".
23. The coefficient of variation for a distribution is 70 and standard deviation is 16. Find the arithmetic mean.
24. Three coins are tossed once. Find the probability of getting atleast two heads.

PART-C

Answer any TEN questions.   10X3=30

25. Out of 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 three languages, find the number of students who know exactly two languages.
26. Let $f = \{(1,1),(2,3),(3,5),(4,7)\}$ be a function from Z to Z defined by
$$f(x) = ax + b, for\ some\ integers\ a\ and\ b. Determine\ a\ and\ b.$$
27. Solve Sin2x-Sin4x+Sin6x=0.
28. Convert the complex number $Z = \frac{-16}{1+i\sqrt{3}}$ into polar form.
29. Find the conjugate of $\frac{(3-2i)(2+3i)}{(1+2i)(2-i)}$.
30. Prove that $nC_r + nC_{r-1} = n + 1C_r$
31. Find the term independent of x in $\left(x^2 + \frac{1}{x}\right)^9$
32. The sum of first three terms of a G.P. is $\frac{39}{10}$ and product is 1. Find the common ratio and the first term.
33. Insert 3 arithmetic means between 8 and 24.
34. Find the equation of the hyperbola whose foci are $(0,\pm12)$ and length of latus rectum is 36 units.
35. Find the derivative of tanx from first principle.
36. Verify by the method of contradiction given p:$\sqrt{5}$ is irrational.

37. Differentiate $\frac{sinx+cosx}{sinx-cosx}$ with respect to 'x'

38. Find the equation of the ellipse whose foci are at $(\pm5,0)$ and x=$\frac{36}{5}$ as one of its directrices .

Part- D

Answer any six questions   6x5=30

39. Find the number of arrangements of the letters of the word 'EXAMINATION' in how many of these arrangements

i) Do the word, start with M

ii) Do all the vowels always occur together?

40. Prove geometrically that $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$ and hence find the value of $\lim_{\theta \to 0} \frac{\sin 4\theta}{\sin 5\theta}$

41. State and prove binomial theorem and hence find $(101)^4$

42. Find the distance between two points in a three dimensional plane and hence find the distance between the points p(-2,3,5) and Q(1,2,3)

43. The mean and standard deviation of 20 observations are found to be 10 and 2 respectively. On rechecking it was found that an observation 8 was incorrect .calculate the correct mean and standard deviation in each of the following cases

i) If wrong item is omitted
ii) If it is replaced by 12

44. Prove using mathematical induction $1^3 + 2^3 + 3^3 + \cdots \ldots \ldots \ldots \ldots n^3 = \frac{n^2(n+1)^2}{4}$

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

46. 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=(1,2,3) and B=(5,6,7)

47. Evaluate $\lim_{x \to 0}(\mathrm{cosecx} - \cot x)$

48. Compute the derivative of f(x) = sinx+cosx

Part-E

Answer any one question   1x10 =10

49. a) prove that $\cos^2 x + \cos^2(x+\frac{\Pi}{3}) + \cos^2\left(x - \frac{\Pi}{3}\right)$ and hence find the value of $\sin^2 x + \sin^2\left(x + \frac{\Pi}{3}\right) + \sin^2\left(x - \frac{\Pi}{3}\right)$

b) find the sum to n terms of the series 5+11+19+29+41+..............

50. A) if p and q are the lengths of the perpendiculars from the origin to the lines xcosθ −ysinθ =kcos2θ and xsecθ+ycosecθ=k respectively,

Prove that $p^2 + 4q^2 = k^2$

b) Differentiate $f(x) = \frac{2}{x+1} \cdot \frac{x^2}{3x-1}$ w.r.t 'x'

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