

I PUC MID-TERM EXAMINATION- SEPTEMBER 2019

TIME : 3Hrs 15 Mins

SUBJECT: MATHEMATICS

MAX MARKS :100

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

(ii)Use the graph sheet for the question in Linear Inequality in part –D.

PART-A

I Answer the following questions

10×1=10M

- Given that the number of subsets of a set A is 16.Find the number of elements in A .
- Define Subset of a set.
- If the set A has 3 elements and the set $B=\{3,4,5\}$.Find the number of elements in $A\times B$.
- Let $A=\{1,2\}$ and $B=\{3,4\}$.Find the number of relations from A to B.
- Convert $40^{\circ}20'$ into radians measure.
- If $\cos x = \frac{-3}{5}$, x lies in the III quadrant then find the value of $\sin x$.
- Find the real number x if $(x-2i)(1+i)$ is purely imaginary.
- Evaluate : $i^{24} + \frac{1}{i^{24}}$.
- Find the value of $6P_3 - 5P_2$.
- How many 3 digit even numbers can be formed from the digits 1,2,3,4,5,6 if the digits can be repeated.

PART-B

II Answer any TEN of the following

10×2=20M

- If X and Y are two sets such that $n(X)=17;n(Y)=23$ and $n(X\cap Y)=38$ Find $n(X\cup Y)$.
- In a school, there are 20 teachers who teach mathematics or physics.Of these 12 teach mathematics and 4 teach both physics and mathematics.How many teach physics.
- If $A=\{1,2\}$, from the set $A\times A\times A$.
- Find the domain and range of $f(x)=\sqrt{9 - x^2}$.
- Find the value of $\cos(-1710^{\circ})$.
- The minute hand of a clock is 2.1 cm long .How far does its tip move in 20 minutes?
- Find the General solution of $\cos x = \frac{1}{2}$.
- Find the modulus and the argument of the complex number $-\sqrt{3}+i$.
- Solve $3x-2 < 2x+1$.Show the graph of the solution on number line.
- Find all pairs of consecutive even positive integer both of which are larger than 5 such that sum is less than 23.
- In how many ways can 4 green,3 red and 2 yellow dices be arranged in row.If the dices of the same colour are indistinguishable?
- Find r if $5.4p_r = 6.5p_{r-1}$.

PART-C

III Answer any TEN of the following

10×3=30M

- In a group of 65 people,40 like cricket,10 like both cricket and tennis.How many like tennis?How many like tennis only and not cricket?

24. If $f(x)=x^2$; $g(x)=2x+1$ be two real functins. Find (i)(f+g)(x) (ii)(f-g)(x) (iii)(f.g)(x).
25. Let $R:Z \rightarrow Z$ be a relation defined by $R=\{(a,b)/ a,b \in Z; a-b \in Z\}$ then show that
 (i) $\forall a \in Z; (a, a) \in R$.
 (ii) $(a,b) \in R \Rightarrow (b,a) \in R$
 (iii) $(a,b) \in R; (b, c) \in R \Rightarrow (a, c) \in R$
26. Prove that $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan\left(\frac{x-y}{2}\right)$.
27. Find the general solution of the equation $2\cos^2 x + 3\sin x = 0$.
28. If $x+iy = \frac{a+ib}{a-ib}$ Prove that $x^2+y^2=1$.
29. Convert the complex number $1+i\sqrt{3}$ into polar form.
30. The marks obtained by a student of class \times in the first and second term examination are 62 and 48 respectively. Find the minimum marks he should get in the annual examination to have an average of atleast 60 marks.
31. Find the term independent of x in the expansion of $(3x^2 - \frac{1}{2x^3})^{10}$.
32. Find $(a+b)^4 - (a-b)^4$. Hence evaluate $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$ using binomial theorem.
33. How many 4 digits numbers can be formed by using the digits 1 to 9 if repetition of digits is not allowed?
34. 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.

PART-D

III Answer any SIX of the following

6×5=30M

35. Define Signum function. Draw the graph of signum function . Write the domain and range of the function.
36. Show that $\cos \frac{2\pi}{15} \cos \frac{4\pi}{15} \cos \frac{8\pi}{15} \cos \frac{14\pi}{15} = \frac{1}{16}$.
37. Prove using mathematical induction $1^3+2^3+3^3+\dots+n^3 = \frac{n^2(n+1)^2}{4}$.
38. Prove using mathematical induction $1.2+2.3+3.4+\dots+n(n+1) = \frac{n(n+1)(n+2)}{3}$.
39. Solve the system of inequalities graphically $3x+4y \leq 60; x+3y \leq 30; x \geq 0; y \geq 0$.
40. What is the number of ways of choosing 4 cards from a pack of 52 cards? In how many of these?
 (i) Four cards are of same suit. (ii) Four cards belong to four different suits. (iii) Four face cards. (iv) Two cards are red cards and two are black cards.
41. A group consists of 5 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has atleast one boy and one girl.
42. State and prove Binomial theorem for any positive integer n.

PART-E

III Answer the following question

1×10=10M

43. (a) Prove geometrically that $\cos(x+y) = \cos x \cos y - \sin x \sin y$. Hence find $\cos 15^\circ$.
 (b) Find the general solution of $\cos 4x = \cos 2x$.