









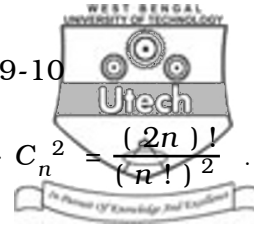


**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Find the angle between the straight lines  $x - 2y + 1 = 0$  and  $x + 3y = 2$ .
- b) Find the equation of the circle concentric to  $x^2 + y^2 - 4x + 6y - 13 = 0$  and passing through the point  $(-4, 5)$ .
- c) Show that the circle  $x^2 + y^2 - 6x - 8y + 23 = 0$  does not touch the straight line  $4x - 7y + 28 = 0$ .
- 5 + 5 + 5
8. a) In how many ways can the letters of the word VOWEL be arranged ?
- i) How many of these begin with V ?
- ii) How many begin with V and do not end with L ?
- b) Show that  $1/(\log_a abc) + 1/(\log_b abc) + 1/(\log_c abc) = 1$
- c) A locomotive engine without a train can run 35 km/hour and its speed is diminished by a quantity which varies as the square root of the number of wagons attached. If with 16 wagons its speed is 15 km/hour, what is the least number of wagons that the engine will fail to move ? Find also the greatest number of wagons that the engine can move. 5 + 5 + 5



9. a) Prove that  $C_0^2 + C_1^2 + C_2^2 + \dots + C_n^2 = \frac{(2n)!}{(n!)^2}$ .
- b) If  $\alpha, \beta$  be the roots of  $ax^2 + bx + c = 0$ , then form an equation whose roots are  $\alpha/\beta$  and  $\beta/\alpha$ .
- c) If  $\alpha, \beta$  be the roots of the equation  $2x^2 - 3x + 4 = 0$ , then find the value of  $\alpha^4 + \beta^4$ . 5 + 5 + 5
10. a) If  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in A.P. and  $(a + b + c) \neq 0$ , then show that  $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$  are also in A.P.
- b) If  $x$  is real, find the maximum value of  $\frac{x+2}{2x^2+3x+6}$ .
- c) Solve for  $x : 4^x - 3 \cdot 2^{x+2} + 2^5 = 0$ . 5 + 5 + 5
11. a) Let  $U = \{ 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 \}$  be the universal set,  $A = \{ 1, 2, 3, 4, 5, 6 \}$  and  $B = \{ 5, 6, 7, \}$ . Then verify that  $(A \cup B)^c = A^c \cap B^c$  and  $A - B = A \cap B^c$ .
- b) If  $a/3 = b/4 = c/7$ , then prove that  $a + b = c$ .
- c) The sum of  $n$  terms of an A.P. is  $n^2$ . Find the series. What is the common difference? Which term is 59?

5 + 5 + 5



12. a) Find the square root of

$$7 + \sqrt{15} + \sqrt{18} + \sqrt{30} .$$

b) If  $y = \frac{\sqrt{x+a} - \sqrt{x-a}}{\sqrt{x+a} + \sqrt{x-a}}$ ,

show that  $y + \frac{1}{y} = \frac{2x}{a}$  .

7 + 8

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