

9) Prove the following by using the principle of mathematical induction for all  $n \in \mathbb{N}$ :

$$\left(1 + \frac{1}{1}\right)\left(1 + \frac{1}{2}\right)\left(1 + \frac{1}{3}\right)\dots\left(1 + \frac{1}{n}\right) = (n+1) \quad (4)$$

10) i) P.T.  $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$  (2)

ii) Find the values of other five trigonometric functions if  $\cos x = -\frac{1}{2}$ ,  $x$  lies in third quadrant. (3)

11) Prove that  $\cot 4x (\sin 5x + \sin 3x) = \cot x (\sin 5x - \sin 3x)$  (3)

12) i) Find  $n$  if  ${}^{n-1}P_3 : {}^n P_4 = 1 : 9$ . (2)

ii) In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls? (2)

13) Find the middle terms in the expansions of  $\left(3 - \frac{x^3}{6}\right)^7$  (3)

14) i) Find the sum to  $n$  terms of the series  $3 \times 8 + 6 \times 11 + 9 \times 14 + \dots$  (2)

ii) Given a G.P. with  $a = 729$  and 7<sup>th</sup> term 64, determine  $S_7$ . (2)

15) i) Evaluate the Given limit:  $\lim_{x \rightarrow 2} \frac{3x^2 - x - 10}{x^2 - 4}$  (3)

ii) Find the derivative of  $x / 1 + \tan x$  (3)

iii) Find the derivative of  $\cos x$  from first principle. (4)

16) i) Let P (3, 2, -4), Q (5, 4, -6) and R (9, 8, -10) are collinear. Find the ratio in which Q divides PR. (2)

ii) Find the coordinates of the points which trisect the line segment joining the points P (4, 2, -6) and Q (10, -16, 6). (2)

17) If A and B are events such that  $P(A) = 0.42$ ,  $P(B) = 0.48$  and  $P(A \text{ and } B) = 0.16$ . Determine (i)  $P(\text{not } A)$ , (ii)  $P(\text{not } B)$  (iii)  $P(A \text{ or } B)$  and (iv)  $P(A \cup B)$  if A and B are mutually exclusive events (4)

18) Find the mean deviation about mean, Variance and Standard Deviation for the following data

$x_i$	92	93	97	98	102	104	109
$f_i$	3	2	3	2	6	3	3

(5)