4. **Write short answers to any NINE (9) questions :** 18

(i) Find the values of all the trigonometric functions of 420°.

(ii) Prove that $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

(iii) Show that $\cos(\alpha + \beta)\cos(\alpha - \beta) = \cos^2\beta - \sin^2\alpha$

(iv) If α, β, γ are the angles of a triangle ABC, then prove that $\tan(\alpha + \beta) + \tan\gamma = 0$

(v) Prove that $1 + \tan\alpha\tan 2\alpha = \sec 2\alpha$

(vi) Prove that $\dfrac{\sin 3x - \sin x}{\cos x - \cos 3x} = \cot 2x$

(vii) Write the domain and range of cosec x.

(viii) Find the period of $\tan\dfrac{x}{7}$

(ix) A vertical pole is 8m high and the length of its shadow is 6m. What is the angle of elevation of the sun at that moment?

(x) If $b = 95$, $c = 34$ and $\alpha = 52^\circ$, find a

(xi) Show that $r_2 = s\tan\dfrac{\beta}{2}$

(xii) Solve the equation $1 + \cos x = 0$

(xiii) Solve the equation $\sin x + \cos x = 0$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Prove that all 2×2 non-singular matrices over the real field form a non – abelian group under multiplication. 5

(b) Find the inverse of $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & -1 & 3 \\ 2 & -4 & 1 \end{bmatrix}$ and show that $A^{-1}A = I_3$ 5

6. (a) Use synthetic division to find the values of p and q if $x + 1$ and $x - 2$ are the factors of the polynomial $x^3 + px^2 + qx + 6$ 5

(b) Find the 18th term of the A.P. if its 6th term is 19 and the 9th term is 31. 5

7. (a) Show that $^{16}C_{11} + {}^{16}C_{10} = {}^{17}C_{11}$ 5

(b) Find the coefficient of x^5 in the expansion of $\left(x^2 - \dfrac{3}{2x}\right)^{10}$ 5

8. (a) If ℓ is arc length of a circle central angle of an arc is θ radian and r is radius of a circle then prove $\ell = r\theta$ $\theta = \dfrac{\ell}{r}$ $r = \dfrac{\ell}{\theta}$ 5

(b) Prove that (without using calculator) $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \dfrac{1}{16}$ 5

9. (a) Solve the triangle ABC, in which $a = 7$, $b = 7$, $c = 9$ 5

(b) Prove that (without using calculator) $\tan^{-1}\dfrac{3}{4} + \tan^{-1}\dfrac{3}{5} - \tan^{-1}\dfrac{8}{19} = \dfrac{\pi}{4}$ 5

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