Inter (Part-I) -A-2021

Roll No._____ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section-I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Seperate into real and imaginary parts $\frac{2-7i}{4+5i}$.

ii. Factorize $3x^2+3y^2$.

iii. Simplify $(2,6)(3,7)$.

iv. Let $A=\{1,2,3,4\}$, Find the relation $\{(x,y)/x+y<5\}$ in A

v. Write the inverse and converse of $\sim p \rightarrow \sim q$

vi. Find the value of x if $\begin{vmatrix} 3 & 1 & x \\ -1 & 3 & 4 \\ x & 1 & 0 \end{vmatrix} = -30$

vii. Find the condition that one root of $x^2+px+q=0$ is multiplicative inverse of other.

viii. Evaluate $(1+w+w^2)(1-w+w^2)$.

ix. Solve the equation $ax=b$ where a,b are the elements of a group G

x. Discuss the nature of roots of the equation $2x^2-5x+1=0$.

xi. If $A=\begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2=\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ then find the values of a and b.

xii. If A and B are square matrices of the same order, then explain why in general $(A+B)(A-B) \neq A^2-B^2$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Which term of the A.P, -2,4,10,.....is 148?

ii. Insert three G.M's between 1 and 16.

iii. Write in factorial form $\frac{(n+1)(n)(n-1)}{3.2.1}$.

iv. Find the value of n, when ${}^{n}P_{4} : {}^{n-1}P_{3} = 9:1$

v. If 5 is the harmonic mean between 2 and b, find b.

vi. Find the number of diagonals of a 6-sided figure.

vii. Evaluate $\sqrt[3]{30}$ correct to two places of decimals.

viii. Expand by binomial theorem $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^3$.

ix. Resolve into partial fractions $\frac{7x+25}{(x+3)(x+4)}$.

x. Resolve into partial fractions without finding the constants $\frac{9x-7}{(x^2+1)(x+3)}$

xi. If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P, show that the common ratio is $\pm\sqrt{\frac{a}{c}}$.

xii. Check whether, $1+\frac{1}{2}+\frac{1}{4}+.....+\frac{1}{2^{n-1}}=2\left(1-\frac{1}{2^n}\right)$ is true for $n=1,2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Prove that $\sec^2\theta - \operatorname{cosec}^2\theta = \tan^2\theta - \cot^2\theta$.

ii. Find the values of $\cos 105^0$ taking $(105^0 = 45^0 + 60^0)$.

iii. Prove that $\dfrac{\sin 8x + \sin 2x}{\cos 8x + \cos 2x} = \tan(5x)$.

iv. Find the period of $\tan(4x)$.

v. Show that $\gamma = (s-c)\tan\left(\dfrac{\gamma}{2}\right)$.

vi. In ΔABC a=3,b=6 and B=$36^0 20'$ Find "b".

vii. Find area of ΔABC if a=18, b=24 and c=30.

viii. Find the value of $\cos^{-1}\left(\dfrac{-1}{2}\right)$.

ix. Solve the equation $1 + \cos x = 0$.

x. Find the soln of equation $\sec x = -2$ which lies in $[0, 2\pi]$.

xi. What is the circular measure of the angle between the hands of a watch at 4 'o' clock.

xii. Find the values of remaining trigonometric functions when $\cos\theta = \dfrac{9}{41}$ and the terminal arm of the angle is in quad Iv

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

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ verify that $(A^{-1})^t = (A^t)^{-1}$.

(b) Solve the system of equations $x + y = 5$; $\dfrac{2}{x} + \dfrac{3}{y} = 2$.

6. (a) Resolve $\dfrac{1}{(1-ax)(1-bx)(1-cx)}$ into partial fractions.

(b) For what value of n, $\dfrac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the positive Geometric Meam (G.M) between a and b.

7. (a) Prove that $C_r^n + C_{r-1}^n = C_r^{n+1}$.

(b) If x is so small that its cube and higher powers can be neglected then show that $\sqrt{\dfrac{1+x}{1-x}} \approx 1 + x + \dfrac{1}{2}x^2$.

8. (a) Two cities A and B lie on the equator such that their longitudes are 45^0E and 25^0W respectively. Find the distance between two cities, taking radius of earth as 6400 kms.

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

9. (a) The sides of a triangle are $x^2 + x + 1, 2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120^0.

(b) Prove that $2\tan^{-1}\left(\dfrac{1}{3}\right) + \tan^{-1}\left(\dfrac{1}{7}\right) = \dfrac{\pi}{4}$.