

Roll No. _____

As per filled in by the candidate.

Mathematics (Objective Type)

Time: 30 Minutes

(For all sessions)

Paper Code	6	1	9	1
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Mark: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A, B, C & D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or pen ink on the answer sheet provided.

- Multiplicative identity of complex number is:
 - (A) (0,0) (B) (0,1) (C) (1,0) (D) (1,1)
- The contrapositive of $\sim p \rightarrow \sim q$ is:
 - (A) $p \rightarrow q$ (B) $q \rightarrow p$ (C) $\sim q \rightarrow \sim p$ (D) $\sim q \rightarrow p$
- If A and B are any two non singular matrices then $(AB)^{-1} =$
 - (A) $A^{-1}B^{-1}$ (B) $B^{-1}A^{-1}$ (C) BA (D) AB
- For a non-singular matrix A if $XA=B$ then $X =$
 - (A) $A^{-1}B$ (B) BA^{-1} (C) $(AB)^{-1}$ (D) $(BA)^{-1}$
- If $f(x) = 3x^2 + 4x^2 + x - 5$ is divided by $x+1$, then remainder is:
 - (A) -8 (B) 7 (C) 6 (D) -7
- If w is cube root of unity, then $w^{15} =$
 - (A) 1 (B) 0 (C) w (D) $-w$
- Partial fraction of $\frac{Ax+B}{x^2+1}(x+3)$ will be of the form.
 - (A) $\frac{Ax+B}{x^2+1} + \frac{C}{x+3}$ (B) $\frac{A}{x^2+1} + \frac{Bx+C}{x+3}$ (C) $\frac{Ax+B}{x+3} + \frac{C}{x^2+1}$ (D) $\frac{A}{x^2+1} + \frac{B}{x+3}$
- If $a_n = (-1)^{n+1}$, then 26^{th} term is:
 - (A) 1 (B) -1 (C) 26 (D) -26
- $(n+1)^{th}$ term of G.P. is:
 - (A) $a_1 r^{n-1}$ (B) $a_1 r^{n+1}$ (C) $a_1 r^{n+2}$ (D) $a_1 r^n$
- n^{th} term of A.P. is:
 - (A) $a_1(n-1)d$ (B) $a_1+(n+1)d$ (C) $2a_1+(n-1)d$ (D) $a_1+(2n-1)d$

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- With usual notation: $C_r^n + C_{r-1}^n =$
 - (A) C_r^{n+1} (B) C_r^{n+1} (C) C_{r-1}^{n-1} (D) C_{r-1}^{n+1}
- In the expansion of $(a+b)^7$, the second term is:
 - (A) a^7 (B) $7a^6b$ (C) $7ab^6$ (D) b
- In one hour, the hour hand of a clock turns through an angle.
 - (A) $\frac{\pi}{8}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$
- $3\frac{\pi}{4}$ radian is equal to:
 - (A) 110° (B) 135° (C) 150° (D) 130°
- $\sin(-300^\circ) =$
 - (A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) 0
- Period of $\sin x$ is:
 - (A) π (B) 2π (C) 3π (D) $-\pi$
- Radius of escribed circle opposite to vertex C is:
 - (A) $\frac{A}{s-a}$ (B) $\frac{A}{s-b}$ (C) $\frac{A}{s-c}$ (D) $\frac{A}{s}$
- With usual notation $a+b-c =$
 - (A) $2S$ (B) $2S-2C$ (C) $2S-2b$ (D) $2S-c$
- $2 \tan^{-1} A =$
 - (A) $\tan^{-1} \frac{2A}{1-A^2}$ (B) $\tan^{-1} \frac{2A}{1+A^2}$ (C) $\tan^{-1} \frac{A}{1-A^2}$ (D) $\tan^{-1} \frac{A}{1+A^2}$
- Solution of $\cot \theta = \frac{1}{\sqrt{3}}$ in quadrant III is:
 - (A) $\frac{5\pi}{3}$ (B) $\frac{7\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\frac{7\pi}{3}$

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

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours

RWP-21

Marks: 80

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

- i. Separate 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, $1 + \frac{1}{2} + \frac{1}{4} + \dots + \frac{1}{2^{n-1}} = 2\left(1 - \frac{1}{2^n}\right)$ is true for $n = 1, 2$.

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Rwp-21

4. Write short answers of any nine parts from the following.

2x9=18

- i. Prove that $\sec^2 \theta - \cos^2 \theta = \tan^2 \theta - \cot^2 \theta$. ii. Find the values of $\cos 105^\circ$ taking $(105^\circ = 45^\circ + 60^\circ)$.
- iii. Prove that $\frac{\sin 8x + \sin 2x}{\cos 8x + \cos 2x} = \tan(5x)$. iv. Find the period of $\tan(4x)$.
- v. Show that $\gamma = (s-c) \tan\left(\frac{\gamma}{2}\right)$. vi. In $\triangle ABC$ $a=3, b=6$ and $B=36^\circ 20'$ Find "b".
- vii. Find area of $\triangle ABC$ if $a=18, b=24$ and $c=30$. viii. Find the value of $\cos^{-1}\left(\frac{-1}{2}\right)$.
- 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 $\cos \theta = \frac{9}{41}$ 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 $x + y = 5$; $\frac{2}{x} + \frac{3}{y} = 2$.

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

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

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

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

8. (a) Two cities A and B lie on the equator such that their longitudes are $45^\circ E$ and $25^\circ W$ 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° .

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

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