

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

(For all sessions)

Paper Code

6

1

9

3

Mathematics (Objective Type)

Time: 30 Minutes

Marks: 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.

1-1. In an oblique triangle, if $a = 200$; $b = 120$ and included angle $\gamma = 150^\circ$, then its area will be equal to:

- (A) 6000 (B) 5000 (C) 2000 (D) 12000

2. If " R " is the circum-radius, then its value is:

- (A) $\frac{ac}{4\Delta}$ (B) $\frac{ab}{4\Delta}$ (C) $\frac{abc}{4\Delta}$ (D) $\frac{abc}{\Delta}$

3. The value of $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$ is equal to:

- (A) 1 (B) -1 (C) $\frac{-1}{2}$ (D) $\frac{1}{2}$

4. The solution of $\cos ec\theta = 2$ in interval $[0, 2\pi]$ is equal to:

- (A) $\frac{\pi}{6}, \frac{7\pi}{6}$ (B) $\frac{\pi}{6}, \frac{5\pi}{6}$ (C) $\frac{\pi}{3}, \frac{5\pi}{6}$ (D) $\frac{\pi}{3}, \frac{\pi}{6}$

5. If $z = \cos\theta + i\sin\theta$, then $|z|$ is equal to:

- (A) 0 (B) 1 (C) 2 (D) 3

6. For any two subsets A and B of set U , then $(A \cup B)'$ is equal to:

- (A) $A \cup B'$ (B) $A \cap B'$ (C) $A' \cup B'$ (D) $A' \cap B'$

7. If " A " is a square matrix and $(A')' = -A$, then " A " is called:

- (A) Skew Symmetric (B) Symmetric (C) Skew Hermitian (D) Hermitian

8. If $A = \begin{bmatrix} 4 & x & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ is a singular matrix, then ' x ' is equal to:

- (A) 3 (B) 4 (C) 6 (D) 7

9. If α and β are roots of $ax^2 + bx + c = 0$, then $\alpha \cdot \beta$ is equal to:

- (A) $-\frac{b}{a}$ (B) $\frac{a}{b}$ (C) $\frac{c}{a}$ (D) $\frac{a}{c}$

10. If " w " is a cube root of unity, then $(1 + w - w^2)(1 - w + w^2)$ will be equal to:

- (A) 3 (B) 4 (C) 2 (D) 1

11. If $\frac{3}{(x-1)(x+2)} = \frac{1}{x-1} + \frac{A}{x+2}$, then "A" is equal to:

- (A) -1 (B) 3 (C) 2 (D) 4

12. The n^{th} root of product of n Geometric Means between a and b is equal to:

- (A) $(ab)^{\frac{1}{n}}$ (B) $a^n b^n$ (C) $n\sqrt{ab}$ (D) \sqrt{ab}

13. If in an A.P. $a_{n-1} = 2n - 5$, then a_n will be equal to:

- (A) $2n+1$ (B) $2n-1$ (C) $n+1$ (D) $n-1$

14. $\frac{n!}{(n-r)!r!}$ is equal to:

- (A) ${}^r C_n$ (B) ${}^r P_n$ (C) ${}^n C_r$ (D) ${}^n P_r$

15. Number of signals given by 5 flags of different colours using 3 flags at a time equals.

- (A) 30 (B) 40 (C) 50 (D) 60

16. Sum of even co-efficient in the expansion of $(1+x)^n$ equals.

- (A) 2^{n+1} (B) 2^{n-1} (C) 2^n (D) 2^{1-n}

17. Third term in the expansion of $(1-2x)^{\frac{1}{3}}$ is equal to:

- (A) $-\frac{9x^2}{4}$ (B) $\frac{9x^2}{4}$ (C) $\frac{4x^2}{9}$ (D) $-\frac{4x^2}{9}$

18. The area of a sector of circular region of radius r and angle θ is equal to:

- (A) $\frac{1}{2}r\theta^2$ (B) $\frac{1}{2}r^2\theta$ (C) $r\theta^2$ (D) $r^2\theta$

19. If $6\cos^2\theta + 2\sin^2\theta = 5$, then $\tan^2\theta$ will be equal to:

- (A) $\frac{3}{2}$ (B) 3 (C) $\frac{1}{3}$ (D) $\frac{2}{3}$

20. Period of $\sin \frac{x}{5}$ is equal to:

- (A) 10π (B) 5π (C) 2π (D) $\frac{2\pi}{5}$

RWP-11-19

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. Find the modulus of complex number $3+4i$.
- ii. Simplify by justifying each step $\frac{\frac{1}{4} + \frac{1}{5}}{\frac{1}{4} - \frac{1}{5}}$ by writing properties.
- iii. Factorize the expression $9a^2 + 16b^2$.
- iv. Define absurdity and give one example.
- v. Solve the system of linear equations. $\begin{cases} 4x_1 + 3x_2 = 5 \\ 3x_1 - x_2 = 7 \end{cases}$
- vi. Find the value of x if $\begin{vmatrix} 1 & 2 & 1 \\ 2 & x & 2 \\ 3 & 6 & x \end{vmatrix} = 0$
- vii. Define Row Rank of a matrix.
- viii. Solve the equation $x^{-2} - 10 = 3x^{-1}$.
- ix. If $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6, 7, 8\}$, $C = \{5, 6, 7, 9, 10\}$ verify distributivity of union over intersection.
- x. Find the inverse of the relation $\{(1, 3), (2, 5), (3, 7), (4, 9), (5, 11)\}$.
- xi. Use remainder theorem to find the remainder when $x^3 - x^2 + 5x + 4$ is divided by $x - 2$.
- xii. Find the roots of the equation $16x^2 + 8x + 1 = 0$ by using quadratic formula.

3. Write short answers of any eight parts from the following.

2x8=16

- i. Resolve $\frac{1}{x^2 - 1}$ into partial fraction.
- ii. Find 5th term of Geometric progression G.P 2, 6, 12,
- iii. Define Circular permutation.
- iv. Expand $(4 - 3x)^{\frac{1}{2}}$ upto three terms.
- v. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in Arithmetic progression (A.P) show that common difference is $\frac{a-c}{2ac}$.
- vi. If 5, 6 are two Arithmetic Means (A.M) between "a" and "b". Find "a" and "b".
- vii. If the numbers $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in (H.P) Harmonic Progression, Find "k".
- viii. How many words can be formed from the letters of "PLAN" using all letters when no letter is to be repeated?
- ix. If ${}^n C_5 = {}^n C_4$, where C stands for combination then find value of n .
- x. Verify the inequality $n > 2^n - 1$ for integral values of $n = 4, 5$.
- xi. If x is so small that its square and higher power can be neglected, show that $\frac{1-x}{\sqrt{1-x}} = 1 - \frac{3}{2}x$.
- xii. Prove that Harmonic Mean (H.M) between two numbers "a" and "b" is $\frac{2ab}{a+b}$.

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

2x9=18

- i. Prove the fundamental identity $\cos^2 \theta + \sin^2 \theta = 1$.
- ii. Verify the result $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$ for $\theta = 30^\circ$.

iii. Show that $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$.

iv. Prove that $\cos 330^\circ \sin 60^\circ + \cos 120^\circ \sin 150^\circ = -1$.

v. Find the period of $\cos ec(10x)$.

vi. Show that $\gamma = 4R \sin \frac{\alpha}{2} \sin \frac{\beta}{2} \sin \frac{\gamma}{2}$ with usual notation.

vii. Find the value of $\cos \left(\sin^{-1} \frac{1}{2} \right)$.

viii. Show that $\frac{\cot^2 \theta - 1}{1 + \cot^2 \theta} = 2 \cos^2 \theta - 1$.

ix. Express the following difference as the product of trigonometric functions $\cos 7\theta - \cos \theta$.

x. In any triangle ΔABC , if $a = 16.1, \alpha = 42^\circ 45', \gamma = 74^\circ 32'$, then find " β " and " α ".

xi. Find the area of triangle ABC, given two sides and their included angle $a = 200, b = 120, \gamma = 150^\circ$.

xii. Find the solutions of the equation $\cot \theta = \frac{1}{\sqrt{3}}$ in the interval $[0, 2\pi]$.

xiii. Find the values of θ satisfying the equation $3 \tan^2 \theta + 2\sqrt{3} \tan \theta + 1 = 0$.

Section -II

Note: Attempt any three questions from the following.

10x3=30

5. (a) Verify De Morgan's Laws for the given sets: $U = \{1, 2, 3, \dots, 20\}, A = \{2, 4, 6, \dots, 20\}, B = \{1, 3, 5, \dots, 19\}$.

(b) Find the value of λ if A is singular matrix, $A = \begin{bmatrix} 4 & \lambda & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$

6. (a) If the roots of $px^2 + qx + r = 0$ are α and β , then prove that $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$.

(b) Resolve into partial fraction $\frac{x^4}{1-x^4}$.

7. (a) The sum of an infinite geometric series is 9 and sum of square of its terms is $\frac{81}{5}$. Find the series.

(b) If $y = \frac{2}{5} + \frac{1.3}{2!} \left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!} \left(\frac{2}{5}\right)^3 + \dots$, then prove that $y^2 + 2y - 4 = 0$.

8. (a) A railway train is running on a circular track of radius 500 meters at the rate of 30Km per hour.

Through what angle will it turn in 10 sec?

(b) If $\tan \alpha = \frac{-15}{8}$ and $\sin \beta = \frac{-7}{25}$ and neither the terminal side of the angle of measure α nor that of β is in IV quadrant. Find $\sin(\alpha + \beta)$ and $\cos(\alpha + \beta)$.

9. (a) One side of a triangular garden is 30m. If two corner angle are $22^\circ \frac{1}{2}$ and $112^\circ \frac{1}{2}$, find the cost of planting the grass at the rate of Rs.5 per square meter.

(b) Prove that $\tan^{-1} \frac{3}{4} + \tan^{-1} \frac{3}{5} - \tan^{-1} \frac{8}{19} = \frac{\pi}{4}$.