

Mathematics (Objective) (For All Sessions) Group-I
Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and 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 $\frac{abc}{4\Delta} =$ RWP-11-1-23
- (A) r_1 (B) r (C) R (D) Δ
2. In any ΔABC $\sqrt{\frac{S(S-c)}{ab}}$ is:
- (A) $\cos \frac{\alpha}{2}$ (B) $\cos \frac{\beta}{2}$ (C) $\cos \frac{\gamma}{2}$ (D) $\cos \alpha$
3. $\cos(\tan^{-1} \theta) =$ _____
- (A) -1 (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$
4. Solution of $1 + \cos x = 0$ in $[0, 2\pi]$ is:
- (A) π (B) $\frac{\pi}{2}$ (C) $\frac{3\pi}{2}$ (D) $\frac{5\pi}{2}$
5. The set $\{1\}$ possess closure property under:
- (A) Addition (B) Multiplication (C) Subtraction (D) Both A & B
6. A function $f: A \rightarrow B$ is called an onto function if:
- (A) Range of $f = A$ (B) Range of $f \neq A$ (C) Range of $f = B$ (D) Range of $f \neq B$
7. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$ then $|A| =$ _____
- (A) 4 (B) 7 (C) 10 (D) 13
8. If order of a matrix "A" is $m \times n$ and order of matrix "B" is $n \times p$ then order of product of matrices AB is:
- (A) $m \times p$ (B) $n \times p$ (C) $m \times n$ (D) $p \times n$
9. The roots of $x^2 - 7x + 10 = 0$ are:
- (A) $-2, -5$ (B) $2, 5$ (C) $-2, 8$ (D) $2, -5$
10. If α, β are the roots of $3x^2 - 2x + 4 = 0$, then sum of roots is:
- (A) $\frac{2}{3}$ (B) $-\frac{2}{3}$ (C) $\frac{4}{3}$ (D) $-\frac{4}{3}$
11. Partial fractions of $\frac{1}{(x-1)(x+1)}$ are:
- (A) $\frac{A}{x-1} + \frac{B}{x+1}$ (B) $\frac{Ax+B}{x-1} + \frac{C}{x+1}$ (C) $\frac{A}{x-1} + \frac{Bx+C}{x+1}$ (D) $\frac{Ax+B}{x^2-1}$
12. Next two terms of sequence 7, 9, 12, 16, are:
- (A) 18, 20 (B) 19, 21 (C) 20, 22 (D) 21, 27
13. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P then common ratio is:
- (A) $\pm \sqrt{\frac{c}{a}}$ (B) $\pm \sqrt{\frac{a}{c}}$ (C) $\pm \sqrt{\frac{b}{c}}$ (D) $\pm \sqrt{\frac{c}{b}}$
14. $n_{P_2} = 30$, then n is:
- (A) 6 (B) 5 (C) 4 (D) 3
15. In how many ways can 4-keys be arranged on a circular key ring:
- (A) 1 (B) 2 (C) 3 (D) 4
16. $n! > n^2$ is true for $n =$ _____
- (A) 1 (B) 2 (C) 3 (D) 4
17. The formula for $(r+1)$ th term of binomial expansion of $(a+x)^n$ is:
- (A) $\binom{n}{r} a^{n-r} x^r$ (B) $\binom{n}{r} a^{n+r} x^r$ (C) $\binom{n}{r} a^n x^{n-r}$ (D) $\binom{n}{r} a^n x^{n+r}$
18. Which one is the quadrantal angle:
- (A) 30° (B) 45° (C) 60° (D) 90°
19. $\cos 2\alpha =$ _____
- (A) $1 - 2\cos^2 \alpha$ (B) $2\cos^2 \alpha - 1$ (C) $\sin \alpha \cos \alpha$ (D) $2\sin \alpha \cos \alpha$
20. Period of $\operatorname{Cosec} \frac{x}{4}$ is:
- (A) 2π (B) 4π (C) 6π (D) 8π

Mathematics (Subjective)

(For All Sessions)

(GROUP-I)

Time: 2:30 hours

SECTION-I

Rwp-11-1-23

2. Write short answers of any eight parts from the following: (8x2=16)
- Name the properties used in equations: (a): $100 + 0 = 100$ (b): $1000 \times 1 = 1000$
 - Separate into real and imaginary parts, if $Z = \frac{i}{1+i}$ iii. Differentiate between Equal and Equivalent sets, with example.
 - Write the set: $\{x|x \in N \wedge 4 < x < 12\}$, in descriptive and tabular forms: v. Define semi-group.
 - Find values of x if $\begin{vmatrix} 3 & 1 & x \\ -1 & 3 & 4 \\ x & 1 & 0 \end{vmatrix} = -30$ vii. If the matrices A and B are symmetric and $AB = BA$, show that AB is symmetric.
 - If $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$, find $A + (\bar{A})^t$ ix. Solve: $x(x+7) = (2x-1)(x+4)$ by factorization.
 - If ω is a cube root of unity, form an equation whose roots are $Z\omega$ and $Z\omega^2$
 - Find two consecutive numbers, whose product is 132. xii. Find the three cube roots of -8

3. Write short answers of any eight parts from the following: (8x2=16)
- Without finding constants write $\frac{x^2-10+13}{(x-1)(x^2-5x+6)}$ into partial fractions. ii. Find vulgar fraction equivalent to recurring decimal 0.7
 - Find the n th term of sequence $(\frac{4}{3})^2, (\frac{7}{3})^2, (\frac{10}{3})^2, \dots$ iv. Calculate geometric means between 4 and 16.
 - If $y = \frac{2x}{3} + \frac{4x^2}{9} + \frac{8x^3}{27} + \dots$ and if $0 < x < \frac{3}{2}$, then show that $x = \frac{2y}{2(1+y)}$
 - Find 12th term of H.P: $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, \dots$ vii. Find the term involving x^{-2} in the expansion of $(x - \frac{2}{x^2})^{13}$
 - How many words can be formed from PLANE using all letters when no letter is to be repeated.
 - Write formula for ${}^n P_r$ and ${}^n C_r$. x. A die is thrown. Find the probability that dots on top are prime numbers.
 - Expand $(1-x)^{1/2}$ up to 4 terms by binomial theorem.
 - If x is so small that its square and higher powers be neglected, then show that: $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1 + \frac{3x}{2}$

4. Write short answers of any nine parts from the following: (9x2=18)
- Define the word "Trigonometry" ii. Find $\tan\theta$ and $\cot\theta$ for $\theta = \frac{19\pi}{3}$
 - Show that $\sin^2(\frac{\pi}{6}) + \sin^2(\frac{\pi}{3}) + \tan^2(\frac{\pi}{4}) = 2$ iv. Find the value of $\cos(\frac{\pi}{12})$
 - Prove that $\sin(180^\circ + \alpha) \sin(90^\circ - \alpha) = -\sin \alpha \cos \alpha$. vi. Define the principal tangent function.
 - Prove that $\sin(\alpha + \beta) \sin(\alpha - \beta) = \cos^2 \beta - \cos^2 \alpha$. viii. Define the period of a Trigonometry function
 - Solve the right triangle ABC in which: $r = 90^\circ$, $b = 68.4$, $c = 96.2$
 - Solve the triangle ABC if $\beta = 60^\circ$, $r = 15^\circ$, $b = \sqrt{6}$
 - Find the area of triangle ABC for $b = 21.6$, $c = 30.2$, $\alpha = 52^\circ 40'$
 - Define the trigonometric equation. xiii. Find the solution of $\operatorname{Cosec} \theta = 2$ which lie in the interval $[0, 2\pi]$

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Find the matrix A if: $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} A = \begin{bmatrix} 0 & -3 & 8 \\ 3 & 3 & -7 \end{bmatrix}$
 (b) For what values of "m" the roots of the equation $x^2 - 2(1+3m)x + 7(3+2m) = 0$ be equal?
6. (a) Resolve into partial fractions $\frac{x^2}{(x-2)(x-1)^2}$
 (b) Find the values of n and r when ${}^{n-1}C_{r-1} : {}^n C_r : {}^{n+1}C_{r+1} = 3 : 6 : 11$
7. (a) Sum the series up to n terms $2 + (2+5) + (2+5+8) + \dots$
 (b) Use binomial theorem to show that: $1 + \frac{1}{4} + \frac{13}{4.8} + \frac{13.5}{4.8.12} + \dots = \sqrt{2}$
8. (a) Prove that $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \tan\theta + \sec\theta$ (b) Prove that $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
9. (a) The measures of sides of a triangular plot are 413, 214 and 375 meters. Find the measure of corner angles of the plot.



Mathematics (Objective)

(For All Sessions)

Group-I

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and 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.

Rwp-11-2-23

- 1.1 The sum of infinite geometric series with common ratio $|r| < 1$ is:

(A) $\frac{a}{1-r}$	(B) $\frac{a}{1+r}$	(C) $\frac{a}{1-r^2}$	(D) $\frac{a}{1+r^2}$
---------------------	---------------------	-----------------------	-----------------------
2. A die is rolled. The probability that the dot on the top is greater than 4 is:

(A) $\frac{1}{6}$	(B) $\frac{1}{3}$	(C) $\frac{1}{2}$	(D) $\frac{2}{3}$
-------------------	-------------------	-------------------	-------------------
3. The value of ${}^{12}C_{10}$ =

(A) 11	(B) 66	(C) 22	(D) 2
--------	--------	--------	-------
4. The sum of exponents of a and b in every term in the expansion of $(a+b)^n$ is:

(A) 1	(B) $n+1$	(C) n	(D) $n-1$
-------	-----------	---------	-----------
5. The inequality $n! > 2^n - 1$ is valid if n is:

(A) $n=3$	(B) $n \leq 3$	(C) $n > 3$	(D) $n \geq 3$
-----------	----------------	-------------	----------------
6. $\frac{2\pi}{3}$ radians =

(A) 120°	(B) 60°	(C) 90°	(D) 30°
-----------------	----------------	----------------	----------------
7. $\sin(2\pi - \theta) =$

(A) $\sin\theta$	(B) $-\sin\theta$	(C) $\cos\theta$	(D) $-\cos\theta$
------------------	-------------------	------------------	-------------------
8. The period of $\sin 2x$ =

(A) 2π	(B) $-\pi$	(C) π	(D) $\frac{\pi}{2}$
------------	------------	-----------	---------------------
9. $\sqrt{\frac{s(s-a)}{bc}} =$

(A) $\sin \frac{\alpha}{2}$	(B) $\sin \frac{\beta}{2}$	(C) $\cos \frac{\alpha}{2}$	(D) $\cos \frac{\beta}{2}$
-----------------------------	----------------------------	-----------------------------	----------------------------
10. Hero's formula for area of triangle is:

(A) $\sqrt{s(s-a)(s-b)(s-c)}$	(B) $\frac{1}{2} bc \sin \alpha$	(C) $\frac{c^2 \sin \alpha \sin \beta}{2 \sin r}$	(D) $\frac{1}{2} ab \sin r$
-------------------------------	----------------------------------	---	-----------------------------
11. $\sin^{-1}\left(-\frac{1}{2}\right) =$

(A) $\frac{\pi}{3}$	(B) $-\frac{\pi}{3}$	(C) $\frac{\pi}{6}$	(D) $-\frac{\pi}{6}$
---------------------	----------------------	---------------------	----------------------
12. If $\sin x = \cos x$ then $x =$

(A) 0°	(B) 30°	(C) 45°	(D) 60°
---------------	----------------	----------------	----------------
13. The equation $x^2 + 1 = 0$ has solution in:

(A) \mathbb{R}	(B) \mathbb{C}	(C) \mathbb{Q}	(D) \mathbb{I}
------------------	------------------	------------------	------------------
14. Let $p \rightarrow q$ be a given conditional then $\sim q \rightarrow \sim p$ is:

(A) Converse	(B) Inverse	(C) Contra positive	(D) Positive
--------------	-------------	---------------------	--------------
15. If A and B are non singular matrices, then $(AB)^{-1}$ is equal to.

(A) $\frac{1}{AB}$	(B) $A^{-1}B^{-1}$	(C) BA	(D) $B^{-1}A^{-1}$
--------------------	--------------------	----------	--------------------
16. $AX = 0$ is homogeneous system with $|A| \neq 0$ then system has:

(A) No solution	(B) Trivial solution	(C) Non-trivial solution	(D) Infinite solution
-----------------	----------------------	--------------------------	-----------------------
17. If $4^{-x} = \frac{1}{2}$ then $x =$

(A) 1	(B) $-\frac{1}{2}$	(C) -1	(D) $\frac{1}{2}$
-------	--------------------	--------	-------------------
18. An equation which remains unchanged when x is replaced by $\frac{1}{x}$ is:

(A) Exponential	(B) Reciprocal	(C) Radical	(D) Reducible
-----------------	----------------	-------------	---------------
19. Partial fractions of $\frac{1}{x^2-1}$ will be of the form:

(A) $\frac{A}{x+1} + \frac{B}{x-1}$	(B) $\frac{Ax+B}{x^2-1}$	(C) $\frac{Ax}{x+1} + \frac{B}{x-1}$	(D) $\frac{A+Bx}{x^2-1}$
-------------------------------------	--------------------------	--------------------------------------	--------------------------
20. General term of the sequence 1,3,5 ... is:

(A) $2n+2$	(B) $2n$	(C) $2n-1$	(D) $3n$
------------	----------	------------	----------

Mathematics (Subjective)

GROUP-II

Time: 2:30 hours

SECTION-I

Rwp-11-2-23

2. Write short answers of any eight parts from the following: (8x2=16)
- Find the multiplicative inverse of $(-4, 7)$
 - Prove that $\bar{\bar{Z}} = Z$ if Z is a real number.
 - Write down the power set of $\{9, 11\}$.
 - Construct the truth table for $(P \wedge \sim P) \rightarrow q$
 - Define a group.
 - If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ find the value of a and b .
 - Find x if $\begin{vmatrix} 1 & x-1 & 3 \\ -1 & x+1 & 2 \\ 2 & -2 & x \end{vmatrix} = 0$
 - Show that AA^t is symmetric for any matrix of order 3×3 .
 - Solve the equation: $(a+b)x^2 + (a+2b+c)x + b+c = 0$
 - Find the condition that one root of $x^2 + px + q = 0$ is double the other.
 - Show that the roots of $(mx+c)^2 = 4ax$ will be equal if $C = \frac{a}{m}, m \neq 0$
 - Solve the equations simultaneously: $x+y=5; x^2+2y^2=17$

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

- Resolve into $\frac{1}{x^2-1}$ partial fraction.
- Write the first three terms of $\left\{ \frac{a}{n} \right\} = \left\{ \frac{1}{2^n} \right\}$
- If n th term of the A.P. is $3n-1$, find the A.P.
- Evaluate: $4!.0!.1!$
- Which term of the sequence: $x^2 - y^2, (x+y), \frac{(x+y)}{(x-y)}, \dots$ is $\frac{x+y}{(x-y)^9}$?
- Define Harmonic Mean. Also derive formula.
- How many numbers greater than 1000,000 can be formed from the digits 0,2,2,2,3,4,4?
- Prove that: $n! > n^2$ for $n = 4, 5$.
- Find the value of n , when ${}^n C_{10} = \frac{12 \times 11}{2!}$
- Expand $(1+x)^{-2}$ upto 3 terms.
- Find the sum of infinite G.P. $2, \sqrt{2}, 1, \dots$
- Using binomial theorem: $(1.03)^{1/3}$, calculate the value upto three decimal places.

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

- Find θ when $l = 1.5 \text{ cm}, r = 2.5 \text{ cm}$
- Write domain and range of $\sin x$
- If $\tan \theta < 0$ and θ in which quadrant θ will lie.
- Prove that $\sin^2 \pi/6 + \sin^2 \pi/3 + \tan^2 \pi/4 = 2$
- Prove that $R = \frac{abc}{4\Delta}$
- State law of Sines.
- Find the distance between $A(3, 8)$ and $B(5, 6)$.
- Prove that $\sin(45^\circ + \alpha) = \frac{1}{\sqrt{2}}(\sin \alpha + \cos \alpha)$
- Find the value of $\sin 2\alpha$ when $\cos \alpha = \frac{3}{5}$ and $0 < \alpha < \pi/2$
- For ΔABC if $\alpha = 35^\circ 17'$; $\beta = 45^\circ 13'$; $b = 421$ find a and r .
- Find the value of $\cos(\sin^{-1} \frac{1}{\sqrt{2}})$
- Solve $\cos x = \frac{\sqrt{3}}{2}$ where $x \in [0, 2\pi]$
- Define trigonometric equation. Give one example.

SECTION-II

Note Attempt any three questions. Each question carries equal marks:

(10x3=30)

5. (a) Reduce the following matrix into echelon form: $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$

- (b) For what value of m will the roots of following equation be equal?
 $(1+m)x^2 - 2(1+3m)x + (1+8m) = 0$

6. (a) Resolve $\frac{x^2+1}{x^3+1}$ into partial fractions.

- (b) A card is drawn from a deck of 52 playing cards. What is the probability that it is a diamond card or an ace?

7. (a) Show that sum of n A.Ms between 'a' and 'b' is equal to n times their A.M.

- (b) If x is very near equal to 1. Then prove that $Px^p - qx^q \approx (p-q)x^{p+q}$

8. (a) A railway train is running on circular track of radius 500 meters at the rate of 30 km per hours. Through what angle it turn in 10 seconds.

- (b) Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$

9. (a) Show that $r_1 = 4R \sin \frac{\alpha}{2} \cdot \cos \frac{\beta}{2} \cdot \cos \frac{\gamma}{2}$

- (b) Prove that $\tan^{-1} \frac{120}{12} = 2 \cos^{-1} \frac{12}{12}$