



Rev-11-18

Inter. (Part-I)-A-2018

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 any ΔABC $r_1 r_2 r_3 =$ _____

(A) Δ^4

(B) Δ^3

(C) Δ^2

(D) Δ

2. With usual notation $\sqrt{\frac{(s-b)(s-c)}{bc}}$ is equal to:

(A) $\cos \frac{\alpha}{2}$

(B) $\sin \frac{\alpha}{2}$

(C) $\sin \frac{\beta}{2}$

(D) $\sin \frac{\gamma}{2}$

3. $\cos^{-1}(-x)$ is equal to:

(A) $\frac{\pi}{2} - \sin^{-1} x$

(B) $\frac{\pi}{2} + \sin^{-1} x$

(C) $\pi + \cos^{-1} x$

(D) $\pi - \cos^{-1} x$

4. Solution of the equation $\tan x + 1 = 0$ is:

(A) $\left\{ \frac{3\pi}{4} + n\pi \right\}$

(B) $\left\{ \frac{\pi}{4} + n\pi \right\}$

(C) $\{ \pi + n\pi \}$

(D) $\{ 2\pi + n\pi \}$, when $n \in \mathbb{Z}$

5. If $z = a + ib$, what is the value of $\cos \theta$?

(A) $\frac{a}{|z|}$

(B) $\frac{b}{|z|}$

(C) $\frac{a}{b}$

(D) $\frac{b}{a}$

6. A function $f: A \rightarrow B$ is surjective if:

(A) Range $f = A$

(B) Range $f = B$

(C) Range $f \neq B$

(D) Range $f \neq A$

7. Determinant of any unit matrix has value:

(A) Greater than 1

(B) less than 1

(C) 1

(D) zero

8. A square matrix A is skew-symmetric if A' is equal to:

(A) A

(B) -A

(C) A'

(D) A^2

9. The discriminant of $ax^2 + bx + c = 0$, $a \neq 0$ is:

(A) $b^2 + 4ac$

(B) $4ac - b^2$

(C) $b^2 - 4ac$

(D) $a^2 - 4ac$

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The degree of the equation $x^3 + 3x^2 + 4x + 5 = 0$ is

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

11. $\frac{x^2+1}{Q(x)}$ will be improper fraction if

- (A) Degree of $Q(x) = 2$
- (B) Degree of $Q(x) = 3$
- (C) Degree of $Q(x) = 4$
- (D) Degree of $Q(x) = 5$

12. $\sum_{k=1}^n K$ is equal to:

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

13. The geometric mean between $-2i$ and $8i$ is:

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

14. If A and B are mutually exclusive events, then $P(A \cup B)$ is equal to:

- (A) $P(A) + P(B)$
- (B) $P(A) - P(B)$
- (C) $P(AB)$
- (D) $P(A) \cap P(B)$

15. If ${}^nC_8 = {}^nC_{12}$, then n is equal to:

- (A) 8
- (B) 12
- (C) 20
- (D) 0

16. In the expansion of $(x+y)^8$, middle term is:

- (A) T_4
- (B) T_6
- (C) T_3
- (D) T_5

17. If n is a positive even integer, then $\binom{n}{1} + \binom{n}{3} + \binom{n}{5} + \dots + \binom{n}{n-1}$ is equal to:

- (A) 2^n
- (B) 2^{n+1}
- (C) 2^{n-1}
- (D) 3^n

18. An angle in the standard position whose terminal side falls on x -axis or y -axis is:

- (A) General angle
- (B) coterminal angle
- (C) Quadrantal angle
- (D) acute angle

19. $\cos(\pi + \theta)$ is equal to:

- (A) $\sec \theta$
- (B) $-\cos \theta$
- (C) $\cos \theta$
- (D) $-\sec \theta$

20. Range of Cosine function is:

- (A) $(-1, 1)$
- (B) $[-1, 1]$
- (C) $[-1, 1)$
- (D) $(-1, 1]$

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

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours

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Marks: 80

Section -I

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

2x8=16

- i. Separate into real and imaginary parts $\frac{i}{1+i}$.
- ii. Simplify $\left(\frac{-1}{2} - \frac{\sqrt{3}}{2}i\right)^3$.
- iii. Write the converse and inverse of $q \rightarrow p$.
- iv. Define the terms proper and improper subsets with example.
- v. Find inverse of $\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$.
- vi. Differentiate between I_n to and on to function.
- vii. For a square matrix A, $|A| = |A'|$.
- viii. What is Rank of matrix? Explain with example.
- ix. Solve $15x^2 + 2ax - a^2 = 0$ by quadratic formula.
- x. If α, β are roots of $3x^2 - 2x + 4 = 0$, find $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.
- xi. Does the set $\{0, -1\}$ possess closure property w.r.t "Addition" and "multiplication"?
- xii. Show that roots of equation $(p+q)x^2 - px - q = 0$ are rational.

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

2x8=16

- i. Resolve into partial fractions $\frac{x^2+1}{x^2-1}$.
- ii. If $y = 1 + \frac{x}{2} + \frac{x^2}{4} + \dots \infty$, show that $x = \frac{2(y-1)}{y}$.
- iii. Prove that $\sum_{k=1}^n K = \frac{n(n+1)}{2}$.
- iv. Find n , if ${}^n P_2 = 30$.
- v. Find n , if ${}^n C_{10} = \frac{12 \times 11}{2!}$.
- vi. Define the probability.
- vii. If 5 and 8 are arithmetic means between a and b find a and b.
- viii. Find 12th term of Harmonic progression $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, \dots$
- ix. In how many ways 4 keys be arranged on a circular key ring?
- x. Prove the formula $1+3+5+\dots+(2n-1) = n^2$ for $n=1, 2$.
- xi. Find the term involving x^4 in the expansion of $(3-2x)^7$.
- xii. Use binomial theorem, find the value to three decimal places $(1.03)^{\frac{1}{3}}$.

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

2x9=18

- i. Verify $2 \sin 45^\circ + \frac{1}{2} \operatorname{cosec} 45^\circ = \frac{3}{\sqrt{2}}$.
- ii. Prove that: $\frac{2 \tan \theta}{1 + \tan^2 \theta} = 2 \sin \theta \cos \theta$.

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iii. Prove that $\tan(45^\circ + A)\tan(45^\circ - A) = 1$.

iv. Prove that: $\frac{\sin 2\alpha}{1 + \cos 2\alpha} = \tan \alpha$

v. Define period of a trigonometric function.

vi. Prove that $\gamma = (s - a)\tan \frac{\alpha}{2}$.

vii. Prove that $\tan^{-1} \frac{1}{4} + \tan^{-1} \frac{1}{5} = \tan^{-1} \frac{9}{19}$.

viii. Solve $\sin x + \cos x = 0$.

ix. Solve the trigonometric equation $\sec^2 \theta = \frac{4}{3}$.

x. Find the radius of the circle in which the arm of the central angle of measure 1 radian cut off an arc of length 35cm.

xi. If α, β be the angle of a triangle ABC then prove that $\cos\left(\frac{\alpha + \beta}{2}\right) = \sin \frac{\gamma}{2}$.

xii. Find the smallest angle of $\triangle ABC$, when $a = 37.34$, $b = 3.24$, $c = 35.06$.

xiii. Find area of triangle ABC given three sides $a = 18$, $b = 24$, $c = 30$.

Section -II

Note: Attempt any three questions from the following.

10x3=30

5. (a) Convert into logical form and prove by truth table of $(A \cap B)' = A' \cup B'$.

(b) Find the value of λ if given system has non-trivial solution

$$x_1 + 4x_2 + \lambda x_3 = 0, 2x_1 + x_2 - 3x_3 = 0, 3x_1 + \lambda x_2 - 4x_3 = 0$$

6. (a) If α, β are the roots of $x^2 - px - p - c = 0$, then prove that: $(1 + \alpha)(1 + \beta) = 1 - C$.

(b) Resolve into partial fraction $\frac{x^2 + a^2}{(x^2 + b^2)(x^2 + c^2)(x^2 + d^2)}$

7. (a) The sum of 9 terms of a A.P is 171 and its eighth term is 31. Find the series.

(b) If x is very nearly equal 1 then prove that: $px^p - qx^q \approx (p - q)x^{p+q}$.

8. (a) Find the value of remaining trigonometric function of $\sin \theta = -\frac{1}{\sqrt{2}}$

and the terminal arm of the angle is not in quad III.

(b) Prove that: $\frac{\sin 3\theta}{\cos \theta} + \frac{\cos 3\theta}{\sin \theta} = 2 \cot 2\theta$.

9. (a) Prove that: $r_1 + r_2 + r_3 - r = 4R$

(b) Prove that: $\sin^{-1} \frac{3}{5} + \sin^{-1} \frac{8}{17} = \sin^{-1} \frac{77}{85}$.