Group-II

گروپ-II

ıll No._____

athematics
me: 30 Minutes

(INTER PART-I) 319-(III)
Code: 6196
OBJECTIVE

GROUP: II

PAPER: I
Marks: 20

ıte: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1- Expansion of $(1+x)^{\frac{-1}{4}}$ is valid only if

(A) $|x|>1$ (B) $|x|<1$ (C) $|x|<-1$ (D) $|x|>-1$

2- The 8^{th} term of sequence $1, -3, 5, -7$ is

(A) 15 (B) -15 (C) 14 (D) -14

3- A reciprocal equation remains unchanged when variable x is replaced by

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

4- The solutions of equation $1 + \sin\theta = 0$ are in quadrant

(A) I and IV (B) I and III (C) II and IV (D) III and IV

5- With usual notations, radius r of inscribed circle is given by

(A) $\frac{\Delta}{s}$ (B) $\frac{s}{\Delta}$ (C) $\frac{\Delta}{s-c}$ (D) $\frac{4\Delta}{abc}$

6- If $\tan\theta = \frac{1}{\sqrt{3}}$ and θ is in III quadrant then $\cot\theta$ equals

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

7- ${}^{n-1}C_r + {}^{n-1}C_{r-1}$ equals

(A) ${}^{n+1}C_r$ (B) ${}^{n+1}C_{r+1}$ (C) ${}^{n}C_r$ (D) ${}^{n-1}C_r$

8- $\sin(\cos^{-1}\frac{1}{2})$ equals

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

9- $(x-1)^2 = x^2 - 2x + 1$ is called

(A) equation (B) inequality (C) identity (D) polynomial

10- For any two matrices A and B then $(AB)^t$ equals

(A) AB (B) A^tB^t (C) B^tA^t (D) BA

11- Additive inverse of $a \in \mathbb{R}$ is

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

(Turn over)

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12- With usual notations, the value of $a + b + c$ is

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

13- $\cos 315^\circ$ equals

(A) $\tan(-45^\circ)$ (B) $\tan 45^\circ$ (C) $\sin 45^\circ$ (D) $\operatorname{cosec} 45^\circ$

14- If A and B are disjoint then $P(A \cup B)$ equals

(A) $P(A) - P(B)$ (B) $P(A)\,P(B)$ (C) $\frac{P(A)}{P(B)}$ (D) $P(A) + P(B)$

15- If $\begin{bmatrix} \lambda & 4 \\ 3 & 2 \end{bmatrix}$ is singular then λ is equal to

(A) 2 (B) 6 (C) 4 (D) 8

16- The middle term in expansion of $(a + x)^n$ when n is even is

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

17- Period of $\operatorname{cosec} 10x$ is

(A) $\frac{\pi}{10}$ (B) $\frac{2\pi}{5}$ (C) $\frac{\pi}{5}$ (D) $\frac{4\pi}{5}$

18- The domain of relation $f = \{(a, 1), (b, 1), (c, 1)\}$ is

(A) {a, b, c} (B) {a} (C) {b} (D) {1}

19- If ω is complex cube root of unity then ω^{15} equals

(A) 1 (B) zero (C) ω (D) $-\omega$

20- The arithmetic mean between $\frac{1}{2}$ and $\frac{1}{4}$ is

(A) $\frac{3}{8}$ (B) $\frac{3}{4}$ (C) $\frac{1}{8}$ (D) $-\frac{1}{8}$

GROUP II

thematics (INTER PART-I) 319 GROUP: II PAPER: I
ıe: 2:30 hours SUBJECTIVE Marks: 80
ıte: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I

Write short answers to any EIGHT questions: (2 x 8 = 16)

i- Separate into real and imaginary parts $\frac{i}{1+i}$

ii- Simplify $(i)^{101}$

iii- Show that $\forall z \in c$, $(\bar{z})^2 + z^2$ is a real number.

iv- For the conditional $p \rightarrow q$. Write its inverse and converse.

v- Define disjunction of two statements p and q

vi- If a, b are elements of a group G, then show that $(ab)^{-1} = b^{-1}a^{-1}$

vii- Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$

viii- Find the value of λ if $A = \begin{bmatrix} 4 & \lambda \\ 7 & 3 \end{bmatrix}$ is singular.

ix- Define upper triangular matrix.

x- Reduce $x^{-2} - 10 = 3x^{-1}$ into quadratic form.

xi- Show that $(x^3 - y^3) = (x - y)(x - \omega y)(x - \omega^2 y)$, where ω is a cube root of unity.

xii- Show that roots of $(p + q)x^2 - px - q = 0$ are rational.

Write short answers to any EIGHT questions: (2 x 8 = 16)

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

ii- Define proper rational fraction.

iii- For the identity $\frac{2x-3}{x(2x+3)(x-1)} = \frac{A}{x} + \frac{B}{2x+3} + \frac{C}{x-1}$ calculate the value of A and C.

iv- Write the first four terms of the sequence $a_n = \frac{n}{2n+1}$

v- How many terms are there in A.P., in which $a_1 = 11$, $a_n = 68$, $d = 3$

vi- Sum the series $\frac{1}{1+\sqrt{x}} + \frac{1}{1-x} + \frac{1}{1-\sqrt{x}} + \ldots\ldots\ldots$ to n terms.

vii- Find the 12^{th} term of the G.P $1+i$, $2i$, $2(1-i)$, ……..

viii- Find the sum of the following infinite geometric series $4 + 2\sqrt{2} + 2 + \sqrt{2} + 1 + \ldots\ldots$

ix- How many arrangements of the letters of the word 'MATHEMATICS', taken all together, can be made?

x- Prove the formula for $n = 1, 2$ $\quad 1 + 2 + 4 + \ldots\ldots\ldots + 2^{n-1} = 2^n - 1$

xi- Calculate $(2.02)^4$ by means of binomial theorem.

xii- Expand $(1+x)^{\frac{-1}{3}}$ upto 4-terms, taking the values of x such that the expansion is valid.

(Turn over)

4. Write short answers to any NINE questions: **(2 x 9 = 18)**

i- What is the length of the arc intercepted on a circle of radius 14 cm by the arms of a central angle of 45°?

ii- Evaluate: $\dfrac{1-\tan^2\frac{\pi}{3}}{1+\tan^2\frac{\pi}{3}}$

iii- Prove that: $\dfrac{1-\sin\theta}{\cos\theta} = \dfrac{\cos\theta}{1+\sin\theta}$

iv- Prove that: $\tan\left(\dfrac{\pi}{4}-\theta\right)+\tan\left(\dfrac{3\pi}{4}+\theta\right)=0$

v- Prove that: $\tan 2a = \dfrac{2\tan\alpha}{1-\tan^2\alpha}$

vi- Find the value of $\cos 2\alpha$ when $\sin\alpha = \dfrac{12}{13}$ where $0 < \alpha < \dfrac{\pi}{2}$

vii- Find the period of $\tan\dfrac{x}{3}$

viii- State law of cosines.

ix- Find the area of the triangle ABC, given three sides $a = 524$, $b = 276$, $c = 315$

x- Show that: $r_1 = s\tan\dfrac{\alpha}{2}$

xi- Prove that: $\sin^{-1}x = \dfrac{\pi}{2} - \cos^{-1}x$

xii- Find the solution of equation: $\sin x = \dfrac{-\sqrt{3}}{2}$

xiii- Solve the equation: $\sin^2 x + \cos x = 1$

SECTION II

5- (a) Prove that all 2 x 2 non-singular matrices over the real field form a non-abelian group under multiplication. 5

(b) For what value of n, $\dfrac{a^n+b^n}{a^{n-1}+b^{n-1}}$ is the positive geometric mean between a and b? 5

6- (a) Use Cramer's rule to solve the system: 5

$$3x_1 + x_2 - x_3 = -4$$
$$x_1 + x_2 - 2x_3 = -4$$
$$-x_1 + 2x_2 - x_3 = 1$$

(b) The members of a club are 12 boys and 8 girls. In how many ways can a committee of 3 boys and 5 girls be formed? 5

7- (a) Solve $4.2^{2x+1} - 9.2^x + 1 = 0$ 5

(b) Find the term involving a^4 in the expansion of $\left(\dfrac{2}{x}-a\right)^9$ 5

8- (a) Prove that: $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$ 5

(b) Reduce $\sin^4\theta$ to an expression involving function of multiple of θ raised to the first power. 5

9- (a) The sides of a triangle are x^2+x+1, $2x+1$, x^2-1. Prove that the greatest angle of the triangle is 120°. 5

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