Intermediate Part First Roll No. ________

MATHEMATICS (Subjective) Group – I

Time: 02:30 Hours Marks: 80

SECTION – I

tempt any EIGHT parts: 16

Define irrational numbers.

Name the properties used in these equations: (a) $4 + 9 = 9 + 4$ (b) $1000 \times 1 = 1000$

) Prove that $\bar{z} = z$ iff z is real.

) Write two proper subsets of $\{a, b, c\}$

Define order of a set.

) Find the inverse of $\{(x, y) \mid y = 2x + 3, x \in \mathbb{R}\}$

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

i) If A and B are square matrices of the same order, then explain why in general $(A + B)(A - B) \neq A^2 - B^2$

Define Hermitian matrix.

Prove that $x^3 + y^3 = (x + y)(x + \omega y)(x + \omega^2 y)$

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

) Write two properties of the cube roots of unity.

tempt any EIGHT parts: 16

Define conditional equation.

If $\frac{2x+1}{(x-1)(x+2)(x+3)} = \frac{A}{x-1} + \frac{B}{x+2} + \frac{C}{x+3}$ find the value of B.

Write partial fraction form of $\frac{8x^2}{(x^2+1)^2(1-x^2)}$

Find the 7th term of $1, \frac{3}{2}, \frac{5}{4}, \frac{7}{8}, \ldots\ldots$

Find the number of terms in the A.P if $a_1 = 3$, $d = 7$ and $a_n = 59$

If 5 and 8 are two A.Ms between a and b. Find a and b.

) Find the 9th term of the harmonic sequence $\frac{-1}{5}, \frac{-1}{3}, -1, \ldots\ldots$

i) If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k.

How many arrangements of the letters of the word, taken all together, can be made 'PAKPATTAN'.

Use mathematical induction to prove $1 + 3 + 5 + \ldots\ldots + (2n - 1) = n^2$ is true for $n = 1$, $n = 2$

Using binomial theorem find the value of $(1.03)^{\frac{1}{3}}$ upto three decimal places.

) Use binomial theorem to expand $(a - \sqrt{2}\,x)^4$

empt any NINE parts: 18

Define radian.

Convert $\frac{9\pi}{5}$ to sexagesimal system.

Prove that $\frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

Find the value of $\tan 15^\circ$, without using calculator.

Prove that $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(Continued P . . . . . 2)

(vi) Prove that $\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

(vii) Find the period of $\cot 8x$

(viii) State the law of sines.

(ix) In the triangle ABC if $\alpha = 35°17'$, $\beta = 45°13'$ and $b = 421$. Find a.

(x) Find the area of the triangle ABC if $a = 200$, $b = 120$, $\gamma = 150°$

(xi) Prove that $\tan^{-1}\frac{1}{4} + \tan^{-1}\frac{1}{5} = \tan^{-1}\frac{9}{19}$

(xii) Solve the equation $4\cos^2 x - 3 = 0$ where $x \in [\,0\,,\,2\pi\,]$

(xiii) Solve $\operatorname{cosec}\theta = 2$, where $\theta \in [\,0\,,\,2\pi\,]$

SECTION – II Attempt any THREE questions. Each question carries 10 marks.

5. (a) Prove that the set $S = \{\,1\,,-1\,,\,i\,,-i\,\}$ is an abelian group under multiplication. 05

(b) Obtain the sum of all integers in the first 1000 which are neither divisible by 5 nor by 2. 05

6. (a) Show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$ 05

(b) A card is drawn from a deck of 52 playing cards. Find the probability that it is a diamond card or an ace. 05

7. (a) Find the values of a and b if -2 and 2 are the roots of the polynomial $x^3 - 4x^2 + ax + b$ 05

(b) If $y = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \ldots\ldots$, then prove that $y^2 + 2y - 4 = 0$ 05

8. (a) Prove that $\frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{\operatorname{cosec}\theta + \cot\theta}$ 05

(b) If α, β, γ are angels of ΔABC, then prove that $\tan\alpha + \tan\beta + \tan\gamma = \tan\alpha\ \tan\beta\ \tan\gamma$ 05

9. (a) Prove that $(r_1 + r_2)\tan\frac{\gamma}{2} = c$ 05

(b) Prove that $\sin^{-1}\frac{1}{\sqrt{5}} + \cot^{-1}3 = \frac{\pi}{4}$ 05

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