



MATHEMATICS HSSC-I

36

Time allowed: 2:35 Hours

Total Marks Sections B and C: 80

NOTE: Attempt any twelve parts from Section 'B' and any four questions from Section 'C' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly. Graph paper will be provided on request.

SECTION - B (Marks 48)

Q. 2 Attempt any TWELVE parts. All parts carry equal marks.

(12 × 4 = 48)

- Separate $\frac{(2-3i)^2}{1-i}$ into real and imaginary parts.
 - Determine whether $p \rightarrow (q \rightarrow p)$ is a tautology, a contingency or an absurdity.
 - If $A = \{1, 2, 3, 4\}$, state the domain and range of the relation $R = \{(x, y) | x + y = 5\}$
 - Under the operation $***$, complete the following table to obtain a semigroup
- | | | | |
|---|---|---|---|
| | a | b | c |
| a | c | a | b |
| b | — | — | c |
| c | b | c | a |
- Find the matrix A if $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} A = \begin{bmatrix} 0 & -3 & 8 \\ 3 & 3 & -7 \end{bmatrix}$
 - Find the inverse of matrix $A = \begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$, hence show that $AA^{-1} = I_2$
 - If α, β are roots of $3x^2 - 2x + 4 = 0$, then find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$
 - Resolve $\frac{3x-11}{(x+3)(x^2+1)}$ into partial fractions.
 - If $y = 1 - \frac{x}{2} + \frac{x^2}{4} - \dots$, then show that $x = 2\left(\frac{1-y}{y}\right)$
 - Find values of n and x , when ${}^nC_r = 10$ and ${}^nP_r = 60$.
 - There are 9 green and 6 red balls in a box. A ball is drawn (taken out). What is the probability that (i) the ball is green (ii) the ball is red.
 - Expand and simplify $(2+i)^6 - (2-i)^6$
 - Find the remaining trigonometric functions if $\cos \theta = -\frac{1}{2}$ and the terminal arm of angle θ is in quad-III.
 - Show that $\frac{\sin(\alpha - \beta)}{\sin(\alpha + \beta)} = \frac{\tan \alpha - \tan \beta}{\tan \alpha + \tan \beta}$
 - Find the measure of smallest angle of the triangle whose sides are 16, 20 and 33
 - Show that $2 \cos^{-1} \frac{4}{5} = \sin^{-1} \frac{24}{25}$

SECTION - C (Marks 32)

Note: Attempt any FOUR questions. All questions carry equal marks.

(4 × 8 = 32)

- Find the real and imaginary parts of the complex number $\frac{(\sqrt{3}-i)^5}{(\sqrt{3}+i)^5}$
- Find the value of λ for which the system $\begin{matrix} x+y+z=0 \\ 2x+y-\lambda z=0 \\ x+2y-2z=0 \end{matrix}$ has a non-trivial solution. Also solve the system for that value of λ
- (a) Resolve $\frac{x^2}{(x^2+4)(x+2)}$ into partial fractions (b) Prove that ${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n$
- Expand $(1-2x)^{\frac{1}{2}}$ to four terms and apply it to evaluate $(0.8)^{\frac{1}{2}}$ correct to three places of decimal
- If $\sin \alpha = \frac{4}{5}$ and $\sin \beta = \frac{12}{13}$, where $\frac{\pi}{2} < \alpha < \pi$ and $\frac{\pi}{2} < \beta < \pi$. Find (i) $\cos(\alpha + \beta)$ (ii) $\sin(\alpha - \beta)$
- (a) Show that $R = \frac{a^2b^2c^2}{4\Delta}$ (b) Solve the equation $\sqrt{3} \tan x - \sec x - 1 = 0$ for its general solution

Mechanical Math 111st Year Past Papers

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