



# 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  $\alpha, \beta$  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  $r$ , 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  $\theta$  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  $\lambda$  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  $\lambda$
- Resolve  $\frac{x^2}{(x^2+4)(x+2)}$  into partial fractions
  - 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)  $\sin(\alpha - \beta)$
- Show that  $R = \frac{a^2b^2c^2}{4\Delta}$
  - Solve the equation  $\sqrt{3} \tan x - \sec x - 1 = 0$  for its general solution

# Mechanical Math 111st Year Past Papers

**Jin-Ying Zhang**



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