



Name :

Roll No. :

Invigilator's Signature :

CS / M.TECH(EIE) / SEM-1 / EAM-101 / 2011-12

2011

ADVANCED ENGINEERING MATHEMATICS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions.

5 × 14 = 70

1. Solve the following by Dynamic Programming approach

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{Subject to } x_1 - x_2 \leq 1; x_1 + x_2 \leq 3; x_1, x_2 \geq 0, \quad 14$$

2. Determine the largest eigenevalue and corresponding eigenvector of the following matrix by using power method :

$$\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix} \quad 14$$

3. Solve by Gradient search method :

$$\text{Maximize } f(x_1, x_2) = 2x_1x_2 + x_2 - x_1^2 - 2x_2^2 \text{ starting from } (0, 0). \quad 14$$



4. Optimize (Using Lagrange's method)

$$z = 10x_1 + 4x_2 - x_1^2 + 4x_1x_2 - 5x_2^2$$

$$\text{subject to } x_1 + x_2 = 6; \quad x_1, x_2 \geq 0$$

14

5. a) Given that $u(x, y) = 4xy - x^3 + 3xy^2$, show that u is harmonic function in C and find the harmonic conjugate v in C for $u(x, y)$. 7

- b) Define entire function and explain with an example. 4

- c) Evaluate $\int_C f(z)dz$, where $f(z) = \bar{z}$ and C is a line segment joining 0 and $4 + 2i$. 3

6. Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ be a linear transformation defined by

$$T(x, y, z) = (x + y, y + z) \text{ verify the theorem Rank } T + \text{Nullity } T = \dim V. \quad 14$$

7. a) Find the positive real root of the following equation by Chebyshev method up to three decimal places

$$x^3 - 3x - 7 = 0. \quad 10$$

- b) Prove the following :

$$\Delta \log f(x) = \log \left[1 + \frac{\Delta f(x)}{f(x)} \right] \quad 4$$

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