I B.Tech Examinations,June 2011
MATHEMATICAL METHODS
Common to ME, BME, IT, MECT, MEP, AME, ICE, E.COMP.E, ETM,
E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours   Max Marks: 80
Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. Express the following quadratic form as 'sum of squares' by congruent transformation and write down the corresponding linear transformation Q $=10x^2+y^2+z^2$-6xy-2yz+xz. [16]

2. (a) Find the rank of $\begin{pmatrix} 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \\ 5 & 6 & 7 & 8 & 9 \\ 15 & 16 & 17 & 18 & 19 \end{pmatrix}$

   (b) Find all the solutions of the following systems of linear homogeneous equations
   x + y + z = 0, 2x + 5y + 7z = 0, 2x - 5y + 3z = 0. [8+8]

3. (a) If $f(x) = \begin{cases} kx; & 0 < x < \dfrac{\pi}{2} \\ k(\pi - x); & \dfrac{\pi}{2} < x < \pi \end{cases}$
   Find the half-range sine series.

   (b) Find the Fourier expansion of f(x)= x cosx; $0 < x < 2\pi$. [8+8]

4. (a) Solve z=px+qy+p^2q^2

   (b) Using Convolution theorem, find the inverse-Z transform of $\frac{1}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}$. [8+8]

5. Determine the characteristic roots and the corresponding characteristic vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [16]

6. (a) The table given below reveals the velocity v of a body during the specified time t. Find the acceleration at t=1.1.

t:	1.0	1.1	1.2	1.3	1.4
v:	43.1	47.7	52.1	56.4	60.8

   (b) Evaluate $\int\limits_{0}^{1} \frac{dx}{1+x}$ by

      i. Trapezoidal rule
      ii. Simpson's one-third rule. [8+8]

7. Find the value of y(0.1) and y(0.2) from $\frac{d^2y}{dx^2} - x \cdot (\frac{dy}{dx})^2 + y^2 = 0$; y(0)=1, $y'(0)$=0 by using Taylor's series correct to 4 decimal places. [16]

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8. (a) Solve the following by iteration method: $x^3 + x^2 = 100$

   (b) Solve for a positive root by False position method: $e^{-x} = \sin x$. [8+8]

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R07

Set No. 4

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