R09

Code No: D5103

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
ADVANCED MATHEMATICS IN CHEMICAL ENGINEERING
(CHEMICAL ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1. Two concentric cylindrical metallic shells are separated by a solid material. If the two metal surfaces are maintained at different constant temperatures, what is the steady-state temperature distribution within the separating material? Formulate the problem.

2. Find the eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

3. Discuss about 'zero eigen values' and 'null spaces'.

4. What is a Bessel's equation? Discuss the solution of Bessel's equation.

5. Define 'finite difference equation' and discuss about linear finite difference equations.

6. Solve the differential equation:
$\left(1+x^2\right)\frac{dy}{dx} + xy = 1$.

7. Consider a section of a flat plate wall of thickness L m whose height and length are both large compared with L. If the temperature distribution is uniform throughout the wall at zero time and heat is supplied at a fixed rate per unit area to the one surface, determine the temperature as a function of position and time.

8. Solve the differential equation using power series
$4x\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + y = 0$.

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