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MMT-007 (P)

00188

MASTERS IN MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE

Term-End Examination

December, 2011

MMT-007 (P) : DIFFERENTIAL EQUATIONS AND NUMERICAL SOLUTIONS

Time : 1½ hours *Maximum Marks : 40*

Note : *There are **two** questions in this paper totalling **30** marks. Answer **both** of them. Remaining **10** marks are for the **viva-voce.***

1. Write a 'C' program to solve the boundary value problem **15**

$$y'' = y - 4xe^x, \quad 0 < x < 1.$$

$$y(0) - y'(0) = -1, \quad y(1) + y'(1) = -e$$

using the shooting method. Use the Taylor series method.

$$y_{i+1} = y_i + h\, y_i' + \frac{h^2}{2} y_i'' + \frac{h^3}{6} y_i'''$$

$$y'_{i+1} = y_i' + h y_i' \frac{h^2}{2} y_i'',$$

With h = 0.2 to solve the resulting initial value problems.

2. Write a 'C' program to solve the equation 15

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < 1, \; t > 0,$$

where $u(0, t) = u(1, t) = 0$, $t > 0$, $u(x, 0) = 2x$, using the Crank-Nicolson method. Obtain the value of $u\left(\frac{1}{2}, \frac{1}{8}\right)$ by taking $h = \frac{1}{4}$, $k = \frac{1}{16}$.