M.Sc. (MATHEMATICS WITH APPLICATIONS IN COMPUTER SCIENCE)

M.Sc. (MACS)

Term-End Practical Examination

00321

June, 2014

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

Time : $1\frac{1}{2}$ 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 program in 'C' language to solve the initial value problem

$$y' = x + y^3, \quad y(0) = 1$$

in the interval [0, 2] using the Predictor-Corrector method :

$$P : y_{n+1} = y_n + \frac{h}{24}\,[55y'_n - 59y'_{n-1} + 37y'_{n-2} - 9y'_{n-3}]$$

$$C : y_{n+1} = y_n + \frac{h}{24}\,[9y'_{n+1} + 19y'_n - 5y'_{n-1} + y'_{n-2}]$$

with $h = 0{\cdot}2$. Calculate the starting value using the Euler's method with the same step length. Perform two corrector iterations per step. *20*

2. Write a program in 'C' language to solve the equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad 0 \le x \le 4, \quad t > 0$$

$$u(x, 0) = \frac{x}{3}(16 - x^2), \quad u(0, t) = u(4, t) = 0$$

with $h = 1$ and $\lambda = \frac{1}{6}$ by using Schmidt method. Integrate for two time levels. *10*