

Reg. No. :

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**Question Paper Code : 71776**

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Sixth Semester

Computer Science and Engineering

MA 2264/MA 41/MA 51/MA 1251/080280026/10177 MA 401/10144 CSE 21/  
10144 ECE 15 — NUMERICAL METHODS

(Common to Sixth Semester – Electronics and Communication Engineering  
Industrial Engineering and Information Technology, Fifth Semester –  
Polymer Technology, Chemical Engineering and Polymer Technology,  
Fourth Semester – Aeronautical Engineering, Civil Engineering,  
Electrical and Electronics Engineering and Mechatronics Engineering)

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Arrive a formula to find the value of  $\sqrt{N}$ , ( $N > 0$ ) using Newton-Raphson method.
2. Write the procedure involved in Gauss Jordan elimination method.
3. Show that  $\Delta_{bcd}^3 \left( \frac{1}{a} \right) = -\frac{1}{abcd}$ .
4. What are the advantages of cubic spline fitting?
5. What are the errors in Trapezoidal and Simpson's rules of numerical integration?
6. State three point Gaussian quadrature formula.
7. State the advantages of RK-method over Taylor-series method.
8. Using Euler's method find  $y(0.2)$  from  $\frac{dy}{dx} = x + y$ ,  $y(0) = 1$ , with  $h = 0.2$ .
9. Write the finite difference approximations of  $y'(x)$  and  $y''(x)$ .
10. State standard five point formula.

11. (a) (i) Solve the equation  $x \log_{10} x = 1.2$  using Newton's method. (8)

(ii) Solve the equations using Gauss-Seidal iterative method

$$4x + 2y + z = 14,$$

$$x + 5y - z = 10 \text{ and}$$

$$x + y + 8z = 20. \quad (8)$$

Or

(b) (i) Find the inverse of the following matrix Gauss Jordan method :

$$\begin{bmatrix} 2 & 2 & 6 \\ 2 & 6 & -6 \\ 4 & -8 & -8 \end{bmatrix}.$$

(8)

(ii) Find all the eigen values of  $A = \begin{pmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{pmatrix}$  using power method. (8)

12. (a) (i) Fit a Lagrange polynomial to the data :

$$x: 1 \quad 2 \quad 3 \quad 5$$

$$y: 0 \quad 1 \quad 26 \quad 124$$

and hence find  $y$  when  $x = 3.5$ . (8)

(ii) From the following data, find  $\theta$  at  $x = 43$  and  $x = 84$

$$x: 40 \quad 50 \quad 60 \quad 70 \quad 80 \quad 90$$

$$\theta: 184 \quad 204 \quad 226 \quad 250 \quad 276 \quad 304$$

Also express  $\theta$  interms of  $x$ . (8)

Or

(b) (i) Using Newton's divided difference formula find  $f(3)$  from the data : (8)

$$x: 0 \quad 1 \quad 2 \quad 4 \quad 5$$

$$f(x): 1 \quad 14 \quad 15 \quad 5 \quad 6$$

(ii) Estimate  $\sin 38^\circ$  from the data given below : (8)

$$x: 0^\circ \quad 10^\circ \quad 20^\circ \quad 30^\circ \quad 40^\circ$$

$$\sin x: 0 \quad 0.17365 \quad 0.34202 \quad 0.5 \quad 0.64279$$

13. (a) (i) Find the value of  $\sec 31^\circ$  using the following data : (8)

$$\theta \text{ (in degrees): } 31^\circ \quad 32^\circ \quad 33^\circ \quad 34^\circ$$

$$\tan \theta: 0.6008 \quad 0.6249 \quad 0.6494 \quad 0.6745$$

(ii) Evaluate  $\int_1^2 \int_1^2 \frac{dx dy}{x^2 + y^2}$  with  $h = 0.2$  along  $x$ -direction and  $k = 0.25$  along  $y$ -direction. (8)

Or

- (ii) Using Romberg's method evaluate  $\int_0^1 \frac{dx}{1+x}$  correct to three decimal places. (8)

14. (a) (i) Solve  $y' = x + y; y(0) = 1$  by Taylor series method. Find the values of  $y$  at  $x = 0.1$  and  $x = 0.2$ . (8)

- (ii) Given  $\frac{dy}{dx} = x^2(1+y), y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$ , evaluate  $y(1.4)$  by Adam's-Bashforth method. (8)

Or

- (b) (i) Using R-K method of fourth order solve  $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$  with  $y(0) = 1$  at  $x = 0.2$ . (8)

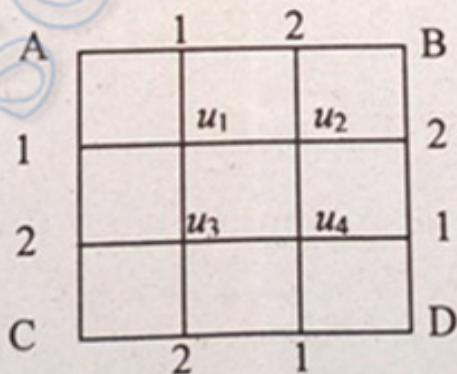
- (ii) Using Milne's method find  $y(4.4)$  given  $5xy' + y^2 - 2 = 0, y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$ . (8)

15. (a) (i) Solve  $y'' - y = 0$ , with  $y(0) = 0, y(1) = 1$  using finite difference method with  $h = 0.2$ . (8)

- (ii) Solve  $y_{tt} = y_{xx}$  upto  $t = 0.5$  with a spacing of 0.1 subject to  $y(0, t) = 0 = y(1, t), y_t(x, 0) = 0$  and  $y(x, 0) = 10 + x(1 - x)$  (8)

Or

- (b) (i) Solve  $u_{xx} + u_{yy} = 0$ , for the following square mesh with boundary condition as shown below. Iterate until the maximum difference between successive values at any grid point is less than 0.001. (8)



- (ii) Given  $\frac{\partial^2 f}{\partial x^2} = \frac{\partial f}{\partial t}, f(0, t) = 0 = f(5, t), f(x, 0) = x^2(25 - x^2)$ , find  $f$  in the range taking  $h = 1$  and upto 5 seconds. (8)