

[No. of Printed Pages – 4]

BT-301/BTS-302

Roll No.

**B. TECH, B. TECH + MBA DUAL DEGREE
PROGRAMMES (CSE, IT, ECE, MAE, CE,
E & EE, E & I, NS & T, S & AE),**

B. TECH (MAE) + M. TECH (A) – DD,

B. TECH + M. TECH (NS & T) – DD &

B. TECH (CSE, ECE, MAE) – EVENING

**THIRD SEMESTER END TERM EXAMINATION :
NOVEMBER, 2013**

NUMERICAL METHODS & OPTIMIZATION

Time : 3 Hrs.

Maximum Marks : 70

Note: Attempt questions from all sections as directed.

SECTION – A (30 Marks)

Attempt any 5 questions.

Each question carries 6 marks.

1. Find the root correct to four decimal places of the equation $xe^x = \cos x$, using the method of False Position.

2. A balloon is in the form of right circular cylinder of radius 1.5 m and length 4 m and is surmounted by hemispherical ends, if the radius is increased by 0.01 m and length by 0.05 m. Find the % change in the volume of the balloon.

P.T.O.

3. Solve the following system of equations by Gauss Seidal iteration method

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

4. Using Newton Divided Difference formula evaluate $f(6)$, given

X	5	7	11	13	21
F(x)	150	392	1452	2366	9702

5. Show that $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$.

6. Find the root of $x^3 + x - 1 = 0$ by iteration method, given that root lies near 1 correct to three decimal places.

SECTION - B (20 Marks)

Attempt any two questions.

Each question carries 10 marks.

7. Solve the following L.P.P

$$\text{Maximize : } Z = 5X_1 + 3X_2$$

$$\text{Subject to : } X_1 + X_2 \leq 2$$

$$5X_1 + 2X_2 \leq 10$$

$$3X_1 + 8X_2 \leq 12 \text{ and } X_1, X_2 \geq 0$$

8. Using Runge-Kutta method of order 4¹, find y for $x = 0.1, 0.2, 0.3$, given that $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$.
9. A tank is discharging water through an orifice at a depth of x meter below the surface of the water whose area is $A\text{m}^2$. The following are the values of x for the corresponding values of A .

A	1.257	1.39	1.52	1.65	1.809	1.962	2.123	2.295	2.462	2.650	2.827
x	1.50	1.65	1.80	1.95	2.10	2.25	2.40	2.55	2.70	2.85	3.00

Using the formula $(0.018) T = \int_{1.5}^{3.0} \frac{A}{\sqrt{x}} dx$, calculate T

the time in seconds for the level of the water to drop from 1.5 m to 3.0 m above the orifice.

SECTION – C (20 Marks)

(Compulsory)

10. (a) Using Lagrange's interpolation formula to find a polynomial which passes through the points $(0,-12)$, $(1,0)$, $(3,6)$ and $(4,12)$. (6)

(b) A rod is rotating in a plane about one of its ends. If the following table gives the angle radians

through which the rod has turned for different values of time t seconds, find its angular velocity at $t = 0.7$ secs. (6)

T second	0.0	0.2	0.4	0.6	0.8	1.0
Radians	0.0	0.12	0.48	0.10	2.0	3.20

(c) Solve the following L.P.P by using the two Phase Method

$$\begin{aligned} & \text{Min } Z = x_1 + x_2 \\ \text{Subject to } & 2x_1 + x_2 \geq 4 \\ & x_1 + 7x_2 \geq 7 \\ & x_1, x_2 \geq 0 \end{aligned} \quad (8)$$