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SEAT No. :

P1326

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TE/Insem./APR-106

T.E. (Mechanical/Auto. Engg./and Sandwich)

NUMERICAL METHODS AND OPTIMIZATION

(2015 Course) (Semester - II) (302047)

Time : 1 Hour] *[Max. Marks :30*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2, Q.3 Or Q.4, Q.5 or Q.6.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Determine the root of equation, $f(x) = x - x^2 + 2$ using successive approximation method. The answer should be accurate, up to 3 decimal places. Take an initial guess as 0 and check condition of convergence. **[6]**

b) Explain the terms with the help of example. **[4]**

i) Truncation error,

ii) Round off error.

OR

Q2) a) Find the root of equation, $f(x) = e^x - 2x - 2$ using bisection method; accurate up to 0.001. Take a=1 and b=2 as initial guesses. **[5]**

b) Draw a flowchart for finding the root of equation using Newton-Raphson method (iteration based). **[5]**

Q3) a) Solve following system of equations by Gauss-Seidal method: **[6]**

$8x+y+4z=9$

$7x+52y+13z=100$

$3x+8y+29z=71$

b) Draw a flowchart for Thomas Algorithm for Tri-diagonal Matrix. **[4]**

OR

P.T.O.

Q4) The upward velocity of a rocket is given at three different times in the following table: **[10]**

Time, t(s)	Velocity, v(m/s)
5	106.8
8	177.2
12	279.2

The velocity data is approximated by a polynomial as,

$v(t) = a_1 t^2 + a_2 t + a_3$, $5 \leq t \leq 12$

Find the values of a_1, a_2, a_3 using the Gauss elimination with partial pivoting.

Q5) Use simplex method to solve following LPP: **[10]**

Minimize $z = 5X_1 + 6X_2$

Subject to $2X_1 + 5X_2 \geq 1500$;

$3X_1 + X_2 \geq 1200$,

Where $X_1, X_2 \geq 0$.

OR

Q6) a) Solve the following LP problem using graphical method: **[6]**

Maximize $Z = 7X_1 + 6X_2$

Subject to $X_1 + X_2 \leq 4$;

$2X_1 + X_2 \leq 6$,

Where $X_1, X_2 \geq 0$.

b) A shop can make two types of sweets (A and B). they use two resources; flour and sugar. To make one packet of A, they need 2 kg of flour and 5 kg of sugar. To make one packet of B, they need 3 kg of flour and 3 kg of sugar. They have 28 kg of flour and 30 kg of sugar. These sweets are sold at Rs. 800 and 900 per packet respectively. Formulate LPP to maximize total revenue. **[4]**

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