SEAT No. :

# TE/Insem./APR-106 <br> T.E. (Mechanical/Auto. Engg./and Sandwich) NUMERICALMETHODSAND OPTIMIZATION <br> (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 $\theta$ and check condition of convergence.[6]
b) Explain the terms with the help of example.
i) Truncation error,
ii) Round off error.

## OR

Q2) a) Find the root of equation, $f(x)=e^{x}-2 x-2$ using bisection method; accurate up to 0.001 . Take $\mathrm{a}=1$ and $\mathrm{b}=2$ as initial guesses.
b) Draw a flowchartfor finding the root of equation using Newton-Raphson method (iteration based).

Q3) a) Solve following system of equations by Gauss-Seidalmethod:

$$
\begin{aligned}
& 8 x+y+4 z=9 \\
& 7 x+52 y+13 z=100 \\
& 3 x+8 y+29 z=71
\end{aligned}
$$

b) Draw a flowchart for Thomas Algorithm for Tri-diagonal Matrix.

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

| Time, $\mathrm{t}(\mathrm{s})$ | Velocity, $\mathrm{v}(\mathrm{m} / \mathrm{s})$ |
| :---: | :---: |
| 5 | 906.8 |
| 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:
Minimize $z=5 X_{1}+6 X_{2}$
Subject to $2 X_{1}+5 X_{2} \geq 1500$;

$$
3 X_{1}+X_{2} \geq 1200
$$

Where $\quad X_{1}, X_{2} \geq 0$.

Q6) a) Solve the following LP problem using graphical method:
Maximize $Z=7 X_{1}+6 X_{2}$
Subject to $X_{1}+X_{2} \leq 4$;

$$
2 X_{1}+X_{2} \leq 6
$$

Where $\quad X_{1}, X_{2} \geq 0$.
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.

## E8E

