Total No. of Questions : 6]

SEAT No. :

P507

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APR - 18/TE/Insem. - 106

T.E. (Mechanical / Automobile)

NUMERICAL METHODS AND OPTIMIZATION

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

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

Instructions to the candidates:

1) ***Solve Q1 or Q2, Q3 or Q4, Q5 or Q6.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of programmable calculator is not permitted.***
5) ***Assume suitable data, if necessary.***

Q1) a) In a cam follower system the displacement 'd' of the follower tip in term of angle of rotation 'θ' is given by **[6]**

$d = \theta + \sin(\theta) \quad 0 \le \theta \le 2\pi$.

Determine value of 'θ' which produces displacement d = 1 cm. Check convergence and solve upto 4 decimal place accuracy. Take initial guess 0.

b) Define the following terms : **[4]**

i) Error propagation.

ii) Significant digits.

iii) Relative error.

iv) Truncation error.

OR

Q2) a) Draw the flowchart for Bisection method. **[6]**

b) Round off the number 8.74350 to three significant digits and compute relative error, absolute error and percentage error. **[4]**

Q3) Solve by Gauss Seidal method for four decimal accuracy for the following system of equations : **[10]**

$28x + 4y - z = 32$

$x + 3y + 10z = 24$

$2x + 17y + 4z = 35$

OR

P.T.O.

Q4) a) Solve the following equations with Thomas algorithm. **[6]**

$x_1 + 2x_2 = 4$

$-x_1 + x_2 + 2x_3 = 1$

$x_2 + 3x_3 + x_4 = 7$

$2x_3 + 2x_4 = 8$

b) Explain step by step procedure for Gauss Jacobi method to compute solution of simultaneous equations. Comment on convergence of Gauss Jacobi method and Gauss Seidal method. **[4]**

Q5) Minimize $Z = 600x_1 + 500x_2$ **[10]**

Subjected to condition

$2x_1 + x_2 \geq 80$

$x_1 + 2x_2 \geq 60$

$x_1, x_2 \geq 0$

Use Simplex method.

OR

Q6) a) Maximize $Z = x + (y/2)$ **[6]**

Subjected to condition

$3x + 2y \leq 12$

$5x \leq 10$

$x + y \leq 18$

$-x + y \geq 4$

$x, y \geq 0$

Solve by graphical method.

b) Define the following terms : **[4]**

i) Feasible solution.

ii) Non negativity condition.

iii) Constraints.

iv) Optimal solution.