

B.TECH. SEM -IV MECHANICAL 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT : NUMERICAL METHODS & OPTIMIZATION TECHNIQUES

Day : **Friday**

Date : **24/11/2017**

Time : **02.30 PM TO 05.30 PM**

Max. Marks : 60

W-2017-2097

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed.
- 4) Assume suitable data if necessary.

Q.1 The divide and average method used for approximating any positive number [10]

can be formulated as $x_{new} = \frac{x_{old} + a/x_{old}}{2}$

Prove that this is equivalent to Newton Raphson algorithm.

OR

Water is flowing in a trapezoidal channel at a rate of $Q = 20 \text{ m}^3/\text{s}$. The critical depth for such a channel must satisfy the equation

$$0 = 1 - \frac{Q^2}{gA_c^3} B$$

Where $g = 9.81 \text{ m/s}^2$, A_c = cross-sectional area (m^2) and B = the width of the channel at surface (m) for this case, width and cross-sectional area of the channel can be related to depth y by

$$B = 3 + y \text{ and } A_c = 3y + \frac{y^2}{2}$$

Solve for critical depth using bisection method.

Q.2 Solve by Gauss Jordan Method: [10]

$$x + 2y + z = 3$$

$$2x + 3y + 3z = 10$$

$$3x - y + 2z = 13$$

OR

Write a MATLAB program to find solution of a system of equations by Gauss Siedal method.

Q.3 Find the fourth order polynomial that takes the following values: [10]

x	0	1	2	3	4
f(x)	1	2	1	10	7

OR

Obtain a relation of the form $y = ab^x$ for following data by method of least squares.

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.2

P.T.O.

- Q.4** Find $y(0.2)$ if $\frac{dy}{dx} = \log(x+y)$; $y(0)=1$ by RK method of second and third degree. [10]

OR

The table given below reveals velocity 'v' of a body during time 't' specified. Find its acceleration at $t = 1.1$.

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

- Q.5** Find minimum of $f(x) = 2x^3 - 9x^2 + 12x + 2$ on $[0, 3]$ using any bracketing method. [10]

OR

What is point estimate method?

- Q.6** What is unidirectional search method? [10]

OR

What is simplex search method?

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