

SE(E) Sem III (OLD) Numerical Techniques.

Con. 2638-09.

(OLD COURSE)

VR-3060

(3 Hours)

Page ①

[Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any **four** questions out of remaining **six** questions.
 (3) Make **suitable** assumptions if **required** and **justify** the same.
 (4) Write programs in C/C++.

MARJEN

1. (a) Define Inherent, Truncation and Round-off error and give an example for each. 5
 (b) Prove that - 5

$$(i) \mu = \frac{1}{2} \left[E^{\frac{1}{2}} + E^{-\frac{1}{2}} \right]$$

$$(ii) \mu^2 = 1 + \frac{\delta^2}{4}$$

- (c) Using Picard's method obtain a solution upto the fifth approximation 5
 $\frac{dy}{dx} = x + y$ such that $y = 1$ when $x = 0$.
 (d) Derive Newton-Raphson formula. 5
2. (a) List the bracketing methods and open methods and find the real of the equation 10
 $x^3 - 9x + 1 = 0$ using bisection method correct to three decimal places.
 (b) Solve the following equations by Gauss - Seidel method. 10
 $20x + y - 2z = 17, \quad 3x + 20y - z = -18, \quad 2x - 3y + 20z = 25$.
3. (a) From the following table find the number of students who obtained marks 10
 less than 45.

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

- (b) Using Newton's divided difference formula, find the value of $f(9)$ from the 10
 following table.

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

4. (a) Write a program for Lagrange's interpolation and using this formula, find the 10
 value of y when $x = 140$ from the following table.

x	110	130	160	190
y	10.8	8.1	5.5	4.8

- (b) Fit a straight line to the following data by the method of least squares. 10

x	1	2	3	4	5	6	7
y	0.5	2.5	2.0	4.0	3.5	6.0	5.5

[TURN OVER

Con. 2638-VR-3060-09.

S. G. U. M. I. T. D. MUM. TECH. 29/5/2018

5. (a) The velocity of the train which starts from rest is given by the following table, 10
the time being reckoned in minutes from the start and speed in km/hour.

Time	3	6	9	12	15	18
Velocity	22	29	31	20	4	0

Estimate approximately the distance covered in 18 minutes by Simpson's 3/8th rule.

- (b) Solve $\frac{dy}{dx} = x + y$ with $x_0 = 0, y_0 = 1$ by Euler's modified formula find the 10
value of y when $x = 0.1$ taking $h = 0.05$.

6. (a) Solve $\frac{dy}{dx} = x^2 + y^2$ with initial conditions $y(1) = 2$ and find y at $x = 1.2, 10$
 $x = 1.4$ by Runge-Kutta Method of Fourth Order taking $h = 0.2$.

- (b) Using the following data, find x for which y is minimum and find this value of y . 10

x	0.60	0.65	0.70	0.75
y	0.6221	0.6155	0.6138	0.6170

7. (a) The current i in the electric circuit is given by $i = 10e^{-t} \sin 2\pi t$ where t is in 10
seconds. Using Newton's method, find the value of t correct to 3 decimal
places for $i = 2$ amp.

- (b) Write a program Simpson's 1/3rd rule. 5

- (c) Write a short note on Golden section search. 5

marks	30-40	40-50	50-60	60-70
no. of students	21	24	28	35

x	5	7	11	13	17
f(x)	120	292	1422	2388	5202

x	100	110	120	130	140
y	4.8	5.2	5.4	5.6	5.8

x	1	2	3	4	5	6
y	0.2	0.5	0.9	1.3	1.8	2.2