DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Semester Examination – May - 2019

Branch: Mechanical Engineering **Sem.:- IV**

Subject with Subject Code:- Numerical Method in Mechanical Engineering (BTMEC404) **Marks: 60**

Date:- 22/5/2019 **Time:- 3 Hr.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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Q.1. **a)** Round off the following to four significant digits **04**

3.26425, 35.46735, 0.00032217, 6.248359

b) The measuring length of bridge and rivet are 9999 and 9 cm respectively, whereas the true value are 10,000 and 10 cm respectively, Compute true error and true percent relative error for each case. **04**

c) A body travels uniformly a distance of (13.8 ± 0.2) in a time (4.0 ± 0.3) find velocity of body with in error limits. **04**

Q.2. a) Explain the concept of bisection method graphically and write the necessary conditions to find out the real root by bisection method. **06**

b) The volume V of liquid in a spherical tank of radius r is related to the depth h of the liquid by $V = \frac{\pi h^2(3r-h)}{3}$. Determine h using Newton-Raphson Method, given r =1 m, and V= 0.5 m^3 **06**

Q.3. a) Use Cramer's rule to solve system of equation **04**

$$-x + 3y - 2z = 5; \quad 4x - y - 3z = -8; \quad 2x + 2y - 5z = 7.$$

b) Solve the system of equation with pivoting with pivoting **04**

$$0.0003120x + 0.006032y = 0.003328; \quad 0.5000x + 0.894y = 0.9471$$

c) Monthly Faculty salary in three departments of an institute is given below, Assuming that salary for particular category is same in all the departments calculate the salary of each category of faculty **04**

Department	Number of Faculty			Total Salary(thousands)
	Professor	Associate professor	Assistant Professor	
A	2	2	4	60
B	3	1	2	50
C	1	4	3	60

Q.4.) a) A solid of revolution is formed by rotating about x-axis the area between the x-axis, the line x=0 and x=l and curve through the points with the following co-ordinates: **06**

X	0.00	0.25	0.50	0.75	1.00
Y	1.000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed, giving answer to three decimal place by using Trapezoidal rule.

b) Velocity of car running on straight road at interval of 2 minutes are given below. **06**

Time (T) (min)	0	2	4	6	8	10	12
Velocity(V) (km/hr)	0	22	30	27	18	7	0

Find the distance covered by car using Simpson's 1/3 rule

Q.5a) Given the equation $\frac{dy}{dx} = \frac{2y}{x}$ with $y(1) = 2$,estimate $y(2)$ using Euler's method using h=0.25 . **04**

b) The experimental values relating centripetal force and radius, for a mass travelling at constant velocity in a circle, are as shown:

Force(N)	5	10	15	20	25	30	35	40
Radius (cm)	55	30	16	12	11	9	7	5

Determine the equations of the regression line of force on radius. **04**

c) Given that $\frac{dy}{dx} = y - x$ where $y(0) = 2$, find $y(0.1)$ with h=0.1 correct to four decimal place by using Range-Kutta fourth order method **04**

Q.6. a) Write the algorithm for finding the real root single root of an equation by Bisection Method **04**

b) Write the algorithm for to find the integration using Simpson's 1/3 rule **04**

c) Write the algorithm for to solve ordinary differential equation using Euler's Method. **04**