

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
M.Tech., Winter2017-18Examination

Semester: 1
Subject Code: 03217101
Subject Name: Computation Methods for Mechanical Engineering

Date: 26/12/2017
Time: 2:00pm to 4:30pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 A) Find the iterative formula to find $\frac{1}{N}$, (N is a non-zero number) and hence find the value of $\frac{1}{19}$. (05)

B) Use 2nd order Runge-Kutta method to find the value of y when $x = 1.2$ given that $y' = x^2 + y^2$ and $y = 0$ when $x = 1$. With $h = 0.1$ (05)

C) Explain main idea of Galerkin's method in brief. (05)

Q.2 Answer the following questions. (Attempt any three) (Each five mark) (15)

A) State properties of stiffness matrix. (total 6 properties)

B) Find the Karl Pearson coefficient of correlation for the following data.

No. of students	1	2	3	4	5	6	7	8	9	10
Marks in CMME	45	70	65	30	90	40	50	75	85	60
Marks in Statistics	35	90	70	40	95	40	60	80	80	50

C) Using explicit algorithm solve parabolic equation $u_t = u_{xx}$ ($0 < x < 1, t > 0$) given $u(0, t) = t^2(1 - t), u(1, t) = t(1 - t^2), u(x, 0) = \sin \pi x$ for two-time steps with $\alpha = \frac{1}{2}$ and $h = 0.2$

D) Solve the initial value problem $\frac{dy}{dx} = x + y, y(1) = 0$ at $x = 1.2$ with $h = 0.1$, using Taylor's series method.

Q.3 A) Using power method find largest Eigen value λ and the corresponding eigen vector of matrix:

$$\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix} \quad (07)$$

B) Give a brief introduction to FVM. (08)

OR

B) Explain conservative discretization. (08)

Q.4 A) Given that $y' = y^2 + 1$ with $y(0) = 0, y(0.2) = 0.2027, y(0.4) = 0.4228, y(0.6) = 0.6841$. Using Milne's Predictor-corrector method, find the value of $y(0.8)$ and $y(1.0)$. (07)

OR

A) Using bisection method, find the positive root of $x - \cos x = 0$ between 0.71875 and 0.75000 correct up to four decimal points. (07)

B) (I) Write a MATLAB program to find area and circumference of a circle for user inputted radius. (04)

B) (II) Write a MATLAB program to check whether the input no. is odd or even. (04)