Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER – I EXAMINATION – SUMMER 2017

Subject Code: 2710002 **Date:08/05/2017**

Subject Name: Computational Method

Time:02:30 p.m. to 05:00 p.m. **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** (I)Solve $y' + 6x^2 y = \dfrac{e^{-2x^3}}{x^2}$ **07**

(II)Find $L(t \cdot \sin wt)$

(b) (I)Solve by Gauss Elimination Method: **07**

$$x + 2y + z = 3$$
$$2x + 3y + 3z = 10$$
$$3x - y + 2z = 13$$

(II)Find the Fourier cosine Integral of $f(x) = e^{-kx}, where \ x > 0, k > 0$

Q.2 **(a)** Solve $y''' + 3y'' + 3y' + y = 8e^{-x} + x + 3$ using Undetermined Coefficient Method **07**

(b) Solve $x^2 y'' - 4xy' + 6y = 21x^{-4}$ using Variation of Parameter Method. **07**

OR

(b) Assuming that one in 80 birds is a case of twins, calculate the probability of 2 or more sets of twins on a day when 30 birds occur. Compare the result obtain by using (I) Binomial Distribution (II) Poisson Approximation. **07**

Q.3 **(a)** (I)State Convolution Theorem and use it to find $L^{-1}\left\{\dfrac{1}{s(s^2+4)}\right\}$ **07**

(II) $L^{-1}\left(\dfrac{s^3 + 2s^2 + 2}{s^3(s^2+1)}\right)$

(b) Define Partial pivoting. Solve the following system of equations using Gauss – Seidel iteration: **07**

$$x + y + 54z = 110$$
$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$

OR

Q.3 **(a)** State Green's Theorem for Circulation curl. And use it to evaluate $\oint_C (6y + x)dx + (y + 2x)dy$ where C:The circle $(x-2)^2 + (y-3)^2 = 4$ **07**

(b) Check whether the set V of all pairs of real numbers of the form $(1, x)$ with the operations defined as $(1, y) + (1, y') = (1, y + y') \ and \ k(1, y) = (1, ky)$ is a vector space or not. **07**

Q.4 **(a)** Find Fourier series for the function $f(x)$ given by **07**

$$f(x) = \begin{cases} 1 + \dfrac{2x}{\pi}; & -\pi \le x < 0 \\ 1 - \dfrac{2x}{\pi}; & 0 \le x \le \pi \end{cases}$$

(b) Solve two Dimensional steady state heat equation where boundary conditions are, **07**

$$u(0, y) = u(L, y) = u(x, 0) = 0 \quad , \quad u(x, a) = \sin\left(\frac{n\pi x}{L}\right)$$

OR

Q.4 **(a)** From the data given below about the treatment of 500 patients suffering from a disease state whether the new treatment is superior to the conventional treatment. **07**

	No. of patients		
	Favourable	Not Favourable	Total
New	280	60	340
Conventional	120	40	160
Total	400	100	500

(Given for $\left(V = 1,\ X^2_{0.05} = 3.84\right)$)

(b) Find the stead state oscillation of the mass-spring system governed by **07**

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 20\cos 2t$$

Q.5 **(a)** Use Runge- Kutta method of order 4, Compute y(0.1),y(0.2) given that **07**

$\frac{dy}{dx} = xy + y^2$; y(0)=1, Taking h=0.1 . Continue the solution at x=0.3 Using Milne's Method.

(b) Find the dominant eigen value of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ by power method & hence find the other eigen Value also. Verify your results by any other matrix theory**.** **07**

OR

Q.5 **(a)** The corresponding values of x and y are given by the following table **07**

x	87.5	84.0	77.8	63.7	46.7	36.9
y	292	283	270	235	197	181

Fit a parabola of the form $y = a + bx + cx^2$ by the method of group averages.

(b) Evaluate $\int_{-2}^{2} \frac{3x}{(4+x)^2}\,dx$ using **07**

(I) Trapezoidal rule

(II) Simpson's 1/3rd rule

(III) Simpson's 3/8 rule

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