

SUBJECT : NANO COMPUTING

Day : Monday  
Date : 19/11/2018

W-2018-3082

Time : 11.00 AM TO 02.00 PM  
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non programmable **CALCULATOR** is allowed.
- 4) Answers to both the sections should be written in **SEPARATE** answer books.

SECTION – I

- Q.1** The equation  $f(x) = x^3 - 7x^2 + 16x - 12 = 0$  has a double root at  $x = 2$  starting with the initial approximation  $x_0 = 1$  find the root correct to three decimal places using Newton – Raphson method. [10]

OR

Use the method of least square to fit the curve  $f(x) = c_0x + \frac{c_1}{\sqrt{x}}$  for the following data: [10]

x	0.2	0.3	0.5	1	2
f(x)	16	14	11	6	3

- Q.2** Find the maximum and minimum values of the following functions using analytical method. [10]
- i)  $f(x) = 3x^4 - 2x^3 + 6x^2 + 6x + 1$  in the interval  $(0, 2)$ .
  - ii)  $f(x) = \sin x(1 + \cos x)$  when  $x = \frac{\pi}{3}$

OR

For the function  $f(x) = 3x^4 - 5x^3 + 6x^2 - 14x + 5$  approximate value of its derivative at  $x = 1$ . [10]

- i) Using Forward difference formula.
  - ii) Using Backward difference formula.
  - iii) Using Central difference formula.
  - iv) Which of the above three is better approximation to the real answer?
- Q.3** Using Laplace Transform solve the initial value problem. [10]
- $$\frac{d^3 y}{dt^3} + \frac{d^2 y}{dt^2} = e^t + t + 1, y(0) = y'(0) = y''(0) = 0$$

OR

Find the Fourier cosine series for the function  $f(x)$  defined by [10]

$$f(x) = \begin{cases} x & \text{for } 0 \leq x \leq \frac{L}{2} \\ L - x & \text{for } \frac{L}{2} \leq x \leq L \end{cases}$$

P.T.O.

**SECTION – II**

**Q.4** Discuss Fourier transform of derivatives. **[10]**

**OR**

Discuss modelling of vibrating string using linear partial differential equation **[10]**

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2} .$$

**Q.5** Discuss Galerkin approximation in relation to finite element method. **[10]**

**OR**

Discuss modified Monte Carlo techniques. **[10]**

**Q.6** Write short note on nano electronics. **[10]**

**OR**

Discuss the role of MATLAB in mathematical modelling in relation to nano modelling. **[10]**

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