M. Tech. (Nano Technology) Sem-II (CBCS – 2015 Course) :
SUMMER - 2019
SUBJECT : NANO COMPUTING

Day : Monday
Date : 03/06/2019

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

S-2019-3347

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non programmable **CALCULATOR** is allowed.
4) Answer to both the sections should be written in **SAME** Answer book.

SECTION – I

Q.1 The velocity V(km/min) of a moped which starts from rest is given at fixed intervals of time t (min) as follows: **[10]**

t	2	4	6	8	10	12	14	16	18	20
y	10	18	25	29	32	20	11	5	2	0

Estimate approximately the distance covered in 20 minutes.

OR

Use L – U decomposition method to solve the system of equations **[10]**

$3x_1 + 2x_2 + 7x_3 = 4$

$2x_1 + 3x_2 + x_3 = 5$

$3x_1 + 4x_2 + x_3 = 7$

Q.2 **i)** The function $f(x)$ defined by $f(x) = \frac{a}{x} + bx$, $f(2) = 1$ has an extremum at $x = 2$. Determine a and b. **[05]**

ii) The velocity of waves of wave-length λ on deep water is proportional to $\sqrt{\frac{a}{\lambda} + \frac{\lambda}{a}}$ where 'a' is certain constant. Prove that the velocity is minimum when λ = a. **[05]**

OR

For the function $f(x) = -0.1x^4 - 0.15x^3 - 0.5x^2 - 0.25x + 1.2$ approximate value of its derivative at $x = 0.5$. **[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 Determine the response of damped vibrating system corresponding to. **[10]**

$\frac{d^2y}{dt^2} + 4y = r(t)$, where $r(t) = \begin{cases} 1 \text{ if } 0 < t < 1 \\ 0 \text{ if } t > 1 \end{cases}$ $y(0) = 1,\ y'(0) = 0$.

OR

Find the Fourier co-efficients of the periodic function $f(x)$ where **[10]**

$f(x) = \begin{cases} -k \text{ if } -\pi < x < 0 \\ k \text{ if } 0 < x < \pi \end{cases}$ and $f(x + 2\pi) = f(x)$

P.T.O.

SECTION – II

Q.4 What is simulation? Discuss data manipulation and data exchange of structures, role in simulation. **[10]**

OR

Explain metropolis algorithm using the Monte Carlo Markov chains. **[10]**

Q.5 Write a note on Monte Carlo methods using the following points : **[10]**

i) The need for Monte Carlo methods

ii) Monte Carlo method in mathematics.

OR

Discuss finite difference methods with reference to truncation error, single and multi-step schemes. **[10]**

Q.6 Discuss Nano-design and Nano CAD. **[10]**

OR

Write a short note on nano-optics. **[10]**

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