F 9193 (Pages : 3) Reg. No.....

Name.....

# B.TECH. DEGREE EXAMINATION, NOVEMBER 2011

## Fifth Semester

Branch : Computer Science and Engineering/Information Technology

ENGINEERING MATHEMATICS—IV (R T)

(Regular/Improvement/Supplementary)

Time : Three Hours Maximum : 100 Marks

*Answer* **one** *question from each module.*
*All questions carry equal marks.*

### Module I

1. (a) For M | M | 1 queueing system, derive the expression for (i) $P_n$ and $P_0$ ;(ii) Average number of customers in the system ; (iii) Average queue length ; (iv) Find the probability that at least ten customers in the system.

(12 marks)

(b) Consider a self service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that eight customers arrive on the average of five minutes and the cashier can serve 10 in 5 minutes. Find (i) the average number of customers queueing for service ; (ii) probability of having at least 10 customers in the system.

(8 marks)

2. (a) For M | M | M queueing system, find the expression for (i) $P_0$ and $P_n$ and (ii) Average queue length.

(10 marks)

(b) A petrol pump station has two pumps. The service time follows the exponential distribution with a mean of 4 minutes and cars arrive for service in a Poisson process at the rate of ten cars per hour. Find the probability that a customer has to wait for service. What proportion of time the pumps remain idle ?

(10 marks)

### Module II

3. (a) Using the bisection method, find a root of $x^3 - x^2 + x - 7 = 0$ correct to three decimal places.

(10 marks)

(b) By using Newton's method, find the root of $x^3 - 3x^2 + 7x - 8 = 0$ correct to three decimal places.

(10 marks)

4. (a) By Horner's method, find the root of the equation $x^3 - 6x - 13 = 0$ in (3, 4) correct to three decimal places.

(10 marks)

**Turn over**

(b) By Gauss-Seidel iterative method, solve the equations :

$$\begin{aligned} 8x_1 - 3x_2 + 2x_3 &= 20 \\ 4x_1 + 11x_2 - x_3 &= 33 \\ 6x_1 + 3x_2 + 12x_3 &= 35 \end{aligned}$$

correct to three decimal places.

(10 marks)

## Module III

5. (a) Using Newton's formula, find the value of $f(1.5)$ from the following data :—

| $x$ | : | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| $f(x)$ | : | 858.3 | 869.6 | 880.9 | 892.3 | 903.6 |

(10 marks)

(b) Using Simpson's rule, evaluate $\int_0^2 \frac{dx}{1+x^3}$ by dividing the range into 10 equal parts.

(10 marks)

*Or*

6. (a) Find the value of the sec 31° using numerical differentiation from the following :—

| $\theta$ in degrees : | 31 | 32 | 33 | 34 |
|---|---|---|---|---|
| $\tan\theta$ : | 0.6008 | 0.6249 | 0.6494 | 0.6745 |

(10 marks)

(b) Given the values :

| $x$ | : | 14 | 17 | 31 | 35 |
|---|---|---|---|---|---|
| $f(x)$ | : | 68.7 | 64 | 44 | 39.1 |

Find the value of $f(x)$ corresponding to $x = 27$.

(10 marks)

## Module IV

7. (a) Using graphical solution method :

Maximize $Z = 3x_1 + 2x_2$

subject to

$$\begin{aligned} 2x_1 - x_2 &\geq -2 \\ x_1 + 2x_2 &\geq 8 \\ x_1, x_2 &\geq 0. \end{aligned}$$

(8 marks)

(b) Using Simplex method :

Maximize $Z = 30x_1 + 23x_2 + 29x_3$

subject to

$$6x_1 + 5x_2 + 3x_3 \leq 52$$
$$6x_1 + 2x_2 + 5x_3 \leq 14$$
$$x_1, x_2, x_3 \geq 0.$$

(12 marks)

*Or*

8. (a) Using Big M-method :

Maximize $Z = 2x_1 + x_2 + 3x_3$

subject to

$$x_1 + x_2 + 2x_3 \leq 5$$
$$2x_1 + 3x_2 + 4x_3 = 12$$
$$x_1, x_2, x_3 \geq 0.$$

(10 marks)

(b) Using principle of duality, solve the LPP :

Maximize $Z = 2x_1 + 3x_2$

subject to

$$-x_1 + x_2 \leq 4$$
$$x_1 + x_2 \leq 6$$
$$x_1 + 3x_2 \leq 9$$
$$x_1, x_2 \geq 0.$$

(10 marks)

## Module V

9. Find the optimum solution for the Transportation problem :

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | Supply |
|---|---|---|---|---|---|---|
| $O_1$ | 2 | 3 | 5 | 7 | 5 | 17 |
| $O_2$ | 4 | 1 | 2 | 1 | 6 | 13 |
| $O_3$ | 2 | 8 | 5 | 1 | 3 | 16 |
| $O_4$ | 5 | 3 | 7 | 2 | 4 | 20 |
| Demand | 16 | 20 | 13 | 12 | 5 | |

(20 marks)

*Or*

10. Solve the following assignment problem and find the minimum assignment cost :

| | Jobs | | | |
|---|---|---|---|---|
| Persons | 1 | 2 | 3 | 4 |
| A | 10 | 12 | 19 | 11 |
| B | 5 | 10 | 7 | 8 |
| C | 12 | 14 | 13 | 11 |
| D | 8 | 15 | 11 | 9 |

(20 marks)

[5 × 20 = 100 marks]