G 1636 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY/JUNE 2006

Fifth Semester

Branches : Computer Science Engineering/Information Technology

ENGINEERING MATHEMATICS—IV (RT)

(New Scheme—2002 admission onwards)

Time : Three Hours Maximum : 100 Marks

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

Module I

1. (a) Explain the objects of queueing theory.

   (b) A petrol station has two pumps. The service time follows the exponential distribution with mean 4 minutes. Cars arrive for service in a Poisson process at the rate of 10 cars per hour.

   (i) Find the probability that a customer has to wait for service.

   (ii) What is the proportion of time the pump remains idle ?

2. (a) The belt shaping for conveyors in open cast mine occur at the rate of 2 per shift. There is only one hot plate available for vulcanising and it can vulcanise on an average 5 bolts snap per shift.

   (i) What is the probability that when a bolt snaps, the hot plate is readily available ?

   (ii) What is the average number in the system ?

   (iii) What is the waiting time of an arrival ?

   (iv) What is the average waiting time plus vulcanising time ?

   (b) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

Module II

3. (a) Find a root of $2x - 3 \sin x - 5 = 0$ correct to four decimal places using Regula Falsi method.

   (b) Using Jacobi method solve the system of equations $10x - 5y - 2z = 3$, $4x - 10y + 3z = 3$, $x + 6y + 10z = -3$, correct to four places of decimals.

4. (a) Evaluate $\sqrt{12}$ correct to four places of decimals, by Newton-Raphson method.

   (b) Using Gauss Seidel method, solve correct to four decimal places the system of equations :

$$\begin{aligned} 27x + 6y - z &= 85 \\ x + y + 54z &= 110 \\ 6x + 15y + 2z &= 72. \end{aligned}$$

Turn over

Module III

5. (a) Derive Newton's forward interpolation formula.

   (b) Using Trapezoidal rule and Simpson's rule evaluate correct to three decimal places $\int_2^3 \frac{x^2}{1+x^3}\,dx$ by dividing (2, 3) into 8 equal parts.

6. (a) Use Lagrange's formula to fit a polynomial to the following data :—

x :	-1	0	2	3
y :	-8	3	1	12

   Hence find the value of y when $x = 1$.

   (b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1{\cdot}6$ and $x = 4$ from the following data :—

x :	1·5	2	2·5	3	3·5	4
y :	3·38	7	13·63	24	38·88	59

Module IV

7. (a) Solve graphically the following Linear Programming Problem :—

   Maximize $Z = 22x_1 + 18x_2$ subject to

   $3x_1 + 2x_2 \leq 48, x_1 + x_2 \leq 20, x_1, x_2 \geq 0.$

   (b) Solve the following Linear Programming Problem by Simplex method :—

   Maximize $Z = 50x_1 + 60x_2 + 60x_3$ such that

   $x_1 + 2x_2 + 3x_3 \leq 7, 2x_1 + 3x_2 \leq 7, x_1, x_2, x_3 \geq 0.$

8. (a) Using Big M method, solve the following Linear Programming Problem :—

   Minimize $Z = 5x_1 + 6x_2$ subject to

   $2x_1 + 5x_2 \geq 1500, 3x_1 + x_2 \geq 1200, x_1, x_2 \geq 0.$

   (b) Apply the principle of duality to solve the following Linear Programing Problem :—

   Minimize $Z = 2x_1 + x_2$ such that

$$\begin{aligned} 3x_1 &+ x_2 \geq 3 \\ 4x_1 &+ 3x_2 \geq 6 \\ x_1 &+ 2x_2 \geq 3 \\ x_1, x_2 &\geq 0. \end{aligned}$$

Module V

9. Solve the following transportation problem for minimum cost :—

	D_1	D_2	D_3	D_4	D_5	D_6	*Supply*
O_1	1	2	1	4	5	2	30
O_2	3	3	2	1	4	3	50
O_3	4	2	5	9	6	2	75
O_4	3	1	7	3	4	6	20
Demand	20	40	30	10	50	25	

10. Solve the following assignment problem of six persons and six jobs in which each job should be assigned to one and only one of the six persons so that the total jobs time is the most minimum.

		Job (in hours)					
		1	2	3	4	5	6
Persons	1	125	130	142	150	178	167
	2	132	180	192	200	181	195
	3	135	145	170	145	128	135
	4	132	142	145	160	135	180
	5	145	173	148	170	141	190
	6	138	137	151	161	160	170