CBCS Scheme

USN | | | | | | | | | | |

15ME561

Fifth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Optimization Techniques

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Define optimization. Mention few engineering applications of optimization. **(08 Marks)**

b. Define single variable optimization problem and prove the necessary condition. **(08 Marks)**

OR

2 a. Define the following : (i) Design vector (ii) Design constraint (iii) Objective function (iv) Objective function surface. **(08 Marks)**

b. Determine maximum and minimum values of the function $f(x) = 12x^5 - 45x^4 + 40x^3 + 5$. **(08 Marks)**

Module-2

3 a. A person requires atleast 10, 12 and 12 units of 3 chemicals A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively / jar. A dry product contains 1, 2 and 4 units of A, B and C respectively / carton. If a liquid product is sold at ₹ 30 per jar and dry product at ₹ 20 per carton. Formulate the model as LPP. **(08 Marks)**

b. Solve the following LPP using graphical method:

Minimize $Z = 20x_1 + 40x_2$

Subjected to $36x_1 + 6x_2 \geq 108$

$3x_1 + 12x_2 \geq 36$

$20x_1 + 10x_2 \geq 100$

$x_1, x_2 \geq 0$ **(08 Marks)**

OR

4 a. An oil refinery can blend 3 grades of crude oil to produce quality P and Q petrol. Two possible blending processes are available. For each production run older process requires 5, 7 and 2 units of crude A, B and C to produce 9 units of P and 7 units of Q. The newer process requires 3, 9 and 4 units of A, B and C to produce 5 units of P and 9 units of Q. Due to prior contract commitments refinery must produce 500 units of P and 300 units of Q for next month. It has availability of 1500, 1900 and 1000 units of crude A, B and C. For each unit of P and Q refinery receives ₹ 60 and ₹ 90 respectively. Find the LP formulation so that revenue is miximised. **(08 Marks)**

b. Solve the following LPP by simplex method:

Maximize $z = 3x_1 + 2x_2$

Subjected to $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$ **(08 Marks)**

Module-3

5 a. For the given cost matrix find the initial solution by Vogel's Approximation Method (VAM) and test for optimality of obtained solution. **(08 Marks)**

	W_1	W_2	W_3	W_4	Supply
F_1	2	2	2	1	3
F_2	10	8	5	4	7
F_3	7	6	6	8	5
Demand	4	3	4	4	

b. Customers arrive at KSRTC booking office window, being managed by a single individual at a rate of 25 per hour. The average time that a customer takes to be serviced is 120 seconds. Assume that customer arrival follows Poissons distribution while service rate is exponential. Compute (i) Traffic intensity or busy period. (ii) Probability that a customer need not wait in queue. (iii) What is the mean queue length? (iv) What is the probability that there are 3 or more units in the system? **(08 Marks)**

OR

6 a. A city corporation has decided to carryout road repairs on main 4 arteries of the city. The government has agreed to make a special grant of 50 lakhs towards the cost with condition that repairs must be done at lowest cost. If required a supplementary token grant will also be considered. The corporation has floated tenders and 5 contractors have sent their bids. Only one road will be awarded to each contractor.

(i) Find the best of assigning the repairworks to contractors and total cost.

(ii) If it is necessary to seek supplementary grants then what should be the amount sought.

(iii) Who among the five contractors will be unsuccessful in his bid? **(10 Marks)**

	R_1	R_2	R_3	R_4
C_1	9	14	19	15
C_2	7	17	20	19
C_3	9	18	21	18
C_4	10	12	18	19
C_5	10	15	21	16

Cost in lakhs

b. Mention the characteristics of waiting lines. **(06 Marks)**

Module-4

7 Use branch and bound technique to solve following problem:

Maximize $Z = 2x_1 + 2x_2$

Subjected to $5x_1 + 3x_2 \leq 8$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$ and are integers. **(16 Marks)**

OR

8 a. Explain iterative Gommory's cutting plane method. **(10 Marks)**

b. Write short notes on multistage decision process. **(06 Marks)**

Module-5

9 a. What is simulation? Mention different types of simulation models. **(06 Marks)**

b. Define static and dynamic inventory models. Mention the assumptions of Deterministic models. **(10 Marks)**

OR

10 a. Mention the limitations of simulation techniques. **(06 Marks)**

b. Derive economic order quantity when stock replenishment is not instantaneous. **(10 Marks)**

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