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TME-601

Even Semester Examination 2017-18

B.TECH. (SEMESTER-VI)

OPERATION RESEARCH

Max Marks : 100

Time: 03:00 Hours

Note: All questions are compulsory.

1. Attempt any Four

   a) What is Operation Research? Discuss its scope.

   b) Define the Linear Programming Problem. Discuss the application of Linear Programming Problem.

   c) A company produces two types of Hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of first and second type to 150 and 250 hats. Assuming that the profits per hat are Rs. 8 for A and Rs. 5 for type B, formulate the problem as a linear programming model in order to determine the number of hats to be produced of each type so as to maximize the profit. Solve this LPP by graphical method to get number of hats for maximum profit.

   d) Solve the following LPP
   Maximize $Z = 15X_1 + 6X_2 + 9X_3 + 2X_4$
   Subject to constraints $2X_1 + X_2 + 5X_3 + 6X_4 \leq 20$,
   $3X_1 + X_2 + 3X_3 + 25X_4 \leq 20$,
   $7X_1 + X_4 \leq 70$
   X_1, X_2, X_3 and $X_4 \geq 0$

   e) Solve the following problem by Simplex method using corresponding condition
   Maximize $z = 3X_1 + 9X_2$
   Subjected to the constrants: $X_1 + 4x_2 \leq 8$, $X_1 + 2X_2 \leq 4$, and $X_1, X_2 \geq 0$

[P.T.O.]

f) Solve the following problem using Dual simplex method

Maximize $z = -2X_1 - X_3$

Subjected to the constrants: $X_1 + X_2 - X_3 \geq 5$, $-X_1 + 2X_2 - 4X_3 \geq -8$, and

$X_1, X_2, X_3 \geq 0$

2. **Attempt Any Two**

a) Explain the Vogel's approximation method (penalty) to find the Initial basic feasible solution of a transportation Problem

b) The company has three cement factories located in cities 1,2,3 which supply cements to four project locations in towns 1,2,3,4. Each plant can supply 6, 1, 10 truck loads of cement daily respectively and the daily cement requirements of projects are 7, 5, 3, 2 truck loads respectively. The transportation cost per truck load of cement (in 100 rupees) from each plant to each project site is as follows:

Project Cities

		1	2	3	4
	1	2	3	1	7
Factorics	2	1	0	6	1
	3	5	8	15	9

Determine the optimal distribution for the company so as to minimize the total transportation cost.

c) Solve the assignment Problem: A Machine Tool Company decides to make four sub assemblies through four contractors. Each contractor is to receive only one sub-assembly. The cost of each subassembly is determine by the bids submitted by each contractor and is shown in table below (in hundred rupees). Assign different assemblies to contractor so as to minimize the cost.

Contractors

		1	2	3	4	Supply ai
	1	15	13	14	17	1
Sub-assemblics	2	11	12	15	13	1
	3	18	12	10	11	1
	4	15	17	14	16	1
Demand bj		1	1	1	1	

3   **Attempt Any Two**

a)   Solve the following game by principle of dominance

Player B

	1	2	3	4	5	6
Player A I	4	2	0	2	1	1
II	4	3	1	3	2	2
III	4	3	7	-5	1	2
IV	4	3	4	-1	2	2
V	4	3	3	-2	2	2

b)   What do you understand by 'zero-sum' in the context of game theory? Explain the meaning following terms used in game theory:

i.   Saddle Point

ii.   Pure Strategy

iii.   Mixed Strategy

c)   Solve the game whose pay-off matrix is given by

|	I	II	III	IV
I	3	2	4	0
II	2	4	2	4
III	4	2	4	0
IV	0	4	0	8

Q.4   **Attempt any Two**

a)   Explain in brief the main characteristics of the queuing system

b)   In a bank there is only one counter. The arrival of customer follow a Poisson process and service times follow an exponential process. The men of the Poisson process are 2 and that of the exponential process is 3. Find

(i)   The probability of exact 5 customers in the system.

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    (ii)   Expected number of customers in the system

    (iii)   The expected queue length of

    (iv)   The expected waiting time in the system.

    (v)   The expected waiting time in the queue.

c)   What is meant by M/M/C model? What happens in a M/M/1 model when mean arrival rate exceeds the mean service rate? Derive the expression for the expected no. of customers in the system for M/M/1 model (Assume the expression for the probability of 'n' customers in the system for n=0, 1, 2,......)

5.   **Attempt any Two**

   a)   Determine EST and LFT in respect of all node points and identify critical path and project duration in respect of the following network.
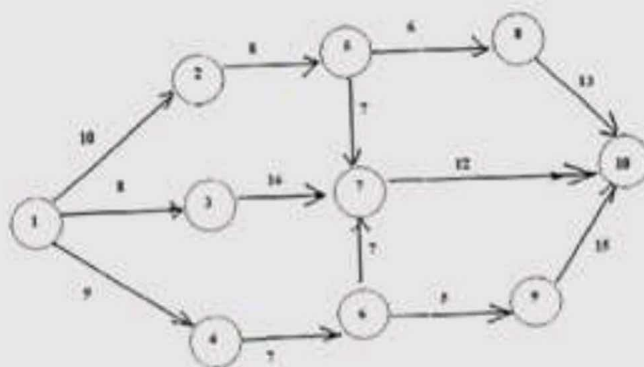
   b)   Define following terms with respect to CPM/PERT :

    (i)   Event

    (ii)   Merge Event

    (iii)   Burst Event

    (iv)   Activity

    (v)   Processor Activity

    (vi)   Successor Activity

    (vii) Dummy Activity

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c) Draw the Network and find the project completion time and critical activity for following activity table.

No.	5	10	15	20	25	30	35	40	45	50	55	60	65	70
Act	B	M	N	Q	A	F	X	C	Y	S	J	T	V	U
Duration	5	4	9	15	1	4	9	9	9	6	5	10	5	10
PREDECESSORS		B	B	B	M,N	N,Q	Q	Q	A,F,X	F	X,F	C	Y,S	V,T,J

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