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Total number of printed pages – 3

MCA
MCC 405(New)

Special Examination – 2012
QUANTITATIVE TECHNIQUES – I

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 × 10

(a) Define Basic feasible solution and optimal solution of a LPP.

(b) Obtain the dual problem of the following primal LP problem

$$\begin{aligned} \text{Maximize } & z = 5x_1 + 3x_2 \\ \text{subject to } & 2x_1 + 3x_2 + x_3 \geq 2 \\ & x_1 + x_2 + 7x_3 = 1 \quad \text{and } x_1, x_2 \geq 0 \end{aligned}$$

(c) What is degeneracy of a Transportation problem ? How it is solved ?

(d) What is a transshipment problem ?

(e) Write the basic structure of a queuing model.

(f) What are transient and steady states ?

(g) What is an inventory model ?

(h) What is an EOQ model ? Explain.

(i) What is PERT and CPM ?

(j) What is a Decision tree ?

2. (a) Using graphical method, Solve the following LPP : 4

$$\begin{aligned} \text{Minimize } & Z = 3x_1 + 4x_2 \\ \text{subject to } & 10x_1 + 3x_2 \geq 30 \\ & 2x_1 + x_2 \geq 6 \\ & 2x_1 + 9x_2 \geq 27, \quad x_1, x_2 \geq 0. \end{aligned}$$

P.T.O.

(b) Using Simplex method, solve the LPP : 6

$$\begin{aligned} \text{Maximize } & Z = -3x_1 - 2x_2 \\ \text{subject to } & x_1 + x_2 \geq 1 \\ & x_1 + x_2 \leq 7 \\ & x_1 + 2x_2 \geq 10, \\ & x_2 \leq 3, \quad x_1, x_2 \geq 0. \end{aligned}$$

3. Using duality solve the following LPP : 10

$$\begin{aligned} \text{Maximize } & z = 2x_1 + x_2 \\ \text{Subject to } & x_1 + 2x_2 \leq 10 \\ & x_1 + x_2 \leq 6 \\ & x_1 - x_2 \leq 2 \\ & x_1 - 2x_2 \leq 1 \\ & x_1, x_2 \geq 0 \end{aligned}$$

4. (a) Find the initial basic feasible solution to the following transportation problem using Vogel approximation method. 5

Destination / source	D1	D2	D3	D4	Supply
S1	42	27	24	35	100
S2	46	37	32	32	60
S3	40	40	30	32	140
Demand	80	40	120	60	

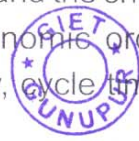
(b) Solve the following assignment problem : 5

Job/persons	A	B	C	D	E
1	30	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

5. (a) What is exponential Distribution ? Write its properties. 4

(b) Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer. 6

6. (a) The annual demand for a component is 7,2000 units. The carrying cost is 500/unit/year. The ordering cost is 1,500 per order and the shortage cost is 2000/unit/year .Find the optimal values of economic order quantity, maximum inventory, maximum shortage quantity, cycle time, inventory period.



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(b) Write notes on :

4

(i) Serial Two-Echelon system

(ii) Serial Multi-Echelon system

7. (a) Construct a network for the project whose activities and their precedence relationships are as a given below :

5

Activites	A	B	C	D	E	F	G	H	I
Immediate predecessor	—	A	A	—	D	B,C,E	F	D	G, H

(b) A project schedule has the following characteristics :

5

Activity	Time	Activity	Time
1-2	2	4-5	5
1-4	2	4-8	8
1-7	1	5-6	4
2-3	4	6-9	3
3-6	1	7-8	3

8. Write notes on :

5×2

(i) Bayesian Decision Rule

(ii) Utility Theory.