

**IV Semester M.C.A. Examination, June 2017  
(CBCS)  
COMPUTER SCIENCE  
MCA-404T : Quantitative Techniques**

Time : 3 Hours

Max. Marks : 70

**Instructions :** Answer any five questions from Part – A and four questions from Part – B.

**PART – A**

Answer any five of the following. Each question carries 6 marks. **(5×6=30)**

1. What is operations research ? Explain three types of models used in operations research, giving suitable example.
2. A company sells two different products A and B. The company makes a profit of Rs. 40 and Rs. 30 per unit on products A and B respectively. The two products are produced in a common production process and are sold in two different markets. The production process had a capacity of 30,000 man hours. It takes 3 hours to produce a unit of A and one hour to produce one unit of B. The market has been surveyed and company officials feel that maximum number of units of A that can be sold is 8,000 and the maximum of B is 12,000 units. Subject to these limitations the products can be sold in any convex combinations. Formulate the problem as a LPP and solve it by graphical method.
3. Obtain initial basic feasible solution for the given transportation problem using VAM (Vogel's Approximation Method).

Origin/Destination	A	B	C	D	Capacity
X	19	30	50	10	07
Y	70	30	40	60	09
Z	40	08	70	20	18
Demand	05	08	07	14	34
					34

P.T.O.



4. Write a note on following :
  - a) PERT and CPM.
  - b) Fundamental theorem of duality.
  - c) Degeneracy in transportation problem.
5. Solve the following game using dominance principle.

	<b>Player B</b>				
	3	5	4	9	6
	5	6	3	7	8
<b>Player A</b>	8	7	9	8	7
	4	2	8	5	3

6. Draw the network diagram and find the critical path.

Activities	Immediate preceding activities	Time (months)
A	None	3
B	None	5
C	None	7
D	A	9
E	C	3
F	B, D	5
G	B, D	10
H	E, F	5
I	A	6
J	G, H	12
K	E, F	8

7. What is dynamic programming ? What are the characteristics of dynamic programming problem ?
8. Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean three minutes.
  - i) What is the probability that a person arriving at the booth will have to wait ?
  - ii) What is the average length of the queue that forms from time to time ?
  - iii) The telephone department will install a second booth when convinced that an arrival would have to wait at least three minutes for the phone. By how much must the flow of arrival be increased in order to justify a second booth ?



PART – B

Answer **any four** of the following. **Each** question carries **10** marks.

**(4×10=40)**

9. Solve the LPP by Simplex Method

$$\begin{aligned} \text{Maximize } Z &= X_1 - X_2 + 3X_3 \\ \text{Subject to } X_1 + X_2 + X_3 &\leq 10 \\ 2X_1 - X_3 &\leq 2 \\ 2X_1 - 2X_2 + 3X_3 &\leq 0 \\ X_1, X_2, X_3 &\geq 0 \end{aligned}$$

10. Solve the following using Penalty method.

$$\begin{aligned} \text{Minimize } Z &= 4X_1 + 2X_2 \\ \text{Subject to } 3X_1 + X_2 &\geq 27 \\ X_1 + X_2 &\geq 21 \\ X_1, X_2 &\geq 0 \end{aligned}$$

11. Obtain the optimal (Minimization) value for the Transportation Problem.

Origin/Destination	A	B	C	Capacity
X	6	8	4	14
Y	4	9	3	12
Z	1	2	6	5
Demand	6	10	15	31
				31

12. A marketing manager has 4 salesman and 4 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows :

	D1	D2	D3	D4
S1	92	78	64	50
S2	68	58	48	38
S3	68	58	48	38
S4	56	48	40	32

Find the assignment of salesman to districts that will results in maximum sale.



13. A salesman has to visit five cities A, B, C D and E. The distance (in hundred miles) between the five cities are as follows :

	A	B	C	D	E
A	-	7	6	8	4
B	7		8	5	6
C	6	8		9	7
D	8	5	9		8
E	4	6	7	8	-

If the salesman starts his journey from city A and has to visit all the cities and come back to city A, which route he should select so that the total distance travelled is minimized.

14. For the given network activities
- Draw the network
  - Critical path, project duration, all types of float values
  - Variance of the critical path
  - Find the probability of completing the project within 70 days.

Activity	Precedence	Optimistic (days)	Most likely	Pessimistic
A	-	2	4	6
B	A	8	12	16
C	A	14	16	30
D	B	4	10	16
E	C, B	6	12	18
F	E	6	8	22
G	D	18	18	30
H	F, G	8	14	32