

Total No. of Questions :5]

[Total No. of Printed Pages :7

MCA - 301**MCA. III Semester**

Examination, June 2014

Computer Oriented Optimization**Time : Three Hours****Maximum Marks : 70**

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
- ii) All parts of each question are to be attempted at one place.
- iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
- iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Define with example : 2
Slack and surplus variables
- b) Write the correspondence between primal and dual linear programming problem. 2
- c) Write down the steps of the graphical method to obtain an optimal solution of a linear programming problem. 3

d) Solve the linear programming problem :

7

$$\text{Minimize } Z = x_1 - 3x_2 + 2x_3$$

Subject to

$$3x_1 - x_2 + 2x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

OR

Solve the following linear programming problem using Big-M method :

7

$$\text{Maximize } Z = 4x_1 + 5x_2 - 3x_3$$

Subject to :

$$x_1 + x_2 + x_3 = 10$$

$$x_1 - x_2 \geq 1$$

$$2x_1 + 3x_2 + x_3 \leq 30$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

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Unit - II

a) Write in brief the application of dynamic programming problem.

2

b) Write mathematical model for travelling salesman problem.

2

c) Find the initial feasible solution by VAM for the following transportation problem:

3

Destinations →	D ₁	D ₂	D ₃	D ₄	Supply ↓
S ₁	19	30	50	10	7
Sources S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand →	5	8	7	14	

d) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as

Jobs	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time and total elapsed time.

7

OR

Solve the following assignment problem :

7

		Job				
		I	II	III	IV	V
Person	A	1	3	3	8	2
	B	7	10	12	5	10
	C	15	2	8	10	7
	D	6	5	3	2	8
	E	9	15	20	6	30

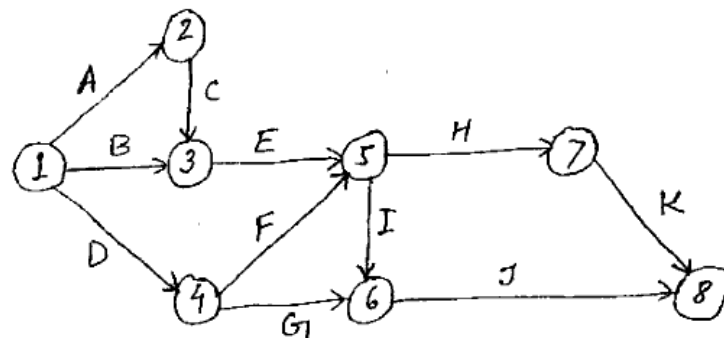
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Unit - III

3. a) Define : 2
- Dummy activity
 - Total float
- b) Explain the three time estimates used in the context of PERT. 2
- c) In a project there are several activities which are listed in the table given below along with the predecessor activity. Draw a network diagram. 3

Activity	Predecessor activity
A	None
B	None
C	A
D	A
E	B
F	C
G	D and E

- d) For the project : 7



given,

Task :	A	B	C	D	E	F	G	H	I	J	K
least time :	4	5	8	2	4	6	8	5	3	5	6
Greatest time:	8	10	12	7	10	15	16	9	7	11	13
Most likely time:	3	7	11	3	7	9	12	6	5	8	3

Find the earliest and latest expected times to each event and also critical path of the network.

OR

A small project is composed of 7 activities whose time estimates are listed in the following table. Activities are identified by their beginning (i) and ending (j) node numbers. 7

Activity (i - j)	Estimated duration (in weeks)		
	Optimistic	most likely	pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- Draw project network.
- Find expected duration of variance for each activity, What is the expected project length?
- What is the probability that the project will be completed at least 3 weeks earlier than expected time?

- iv) If the project due date is 18 weeks, what is the probability of not meeting the due date?

Unit - IV

4. a) Define transient and steady states. 2
 b) Describe the basic queuing process. 2
 c) Give some important applications of queuing theory. 3
 d) In a bank cheques are cashed at a single 'teller' counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers per hour. The teller takes, on an average minute and a half to cash cheque. The service time has been shown to be exponentially distributed.
 i) Calculate the percentage of time the teller is busy.
 ii) Calculate the average time a customer is expected to wait. 7

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OR

Trains arrive at the yard every 15 minutes and service time is 33 minutes. If the capacity of the yard is limited to 4 trains, find :

- i) The probability that the yard is empty.
 ii) The average number of trains in the system. 7

Unit - V

5. a) Describe the purposes for carrying out the inventory. 2
 b) Define : Deterministic and probabilistic models. 2
 c) Write merits and de merits of inventory. 3
 d) An item is produced at the rate of 50 items per day. The demand occurs at the rate of 25 items per day. If the setup cost is Rs. 100 per setup and holding cost is Rs. 0.01 per unit of item per day, find the economic lot size for one run, assuming that the shortages are not permitted. 7

OR

The demand rate of a particular item is 12,000 units per year. The setup cost per run is Rs.350 and the holding cost is Rs. 0.20 per unit per month. If no shortages are allowed and the replacement is instantaneous determine :

- i) The optimum run size
 ii) The optimum scheduling period
 iii) Minimum total expected annual cost. 7
