Sem VI / CBGS) Auto / OR / M-J-15 3/6/15

(REVISED COURSE) **Q.P. Code : 5122**

(3 Hours) **[Total Marks : 80**

N.B.:
(1) **Question number 1 is compulsory**
(2) Solve any **three** questions from the remaining five questions
(3) Figures to right indicate full marks
(4) Assume suitable data if **necessary.**
(5) Notations carry usual meaning.

Q.1 **Attempt any four**

(A) Distinguish between CPM and PERT. (05)

(B) Diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 calories. Two foods A and B are available at a cost of Rs.4 and Rs.3 per unit respectively. If one unit of A contains 200 units of vitamins,1 unit of mineral and 40 calories and one unit of B contains 100 units of vitamins, 2 units of minerals and 40 calories. Formulate the problem as Linear programming model. (05)

(C) Convert the following primal problem into dual (05)

Maximize $Z=5X_1 + 2X_2$
Subject to

$$2X_1 + 7X_2 \leq 100$$
$$3X_1 + 8X_2 \leq 135$$
$$X_1 \text{ and } X_2 \geq 0$$

(D) Consider the details of two competing alternatives as shown in the following table .The initial outlay of each of the alternatives is Rs.5000000.The life of each alternative is 15 years.Find the best alternatve when the interest rate is 0% using the expected value criterion. (05)

Alternative 1		Alternative 2	
Annual Revenue (Rs)	Probability	Annual Revenue (Rs)	Probability
1200000	0.25	2200000	0.20
1900000	0.45	2400000	0.45
2800000	0.30	3200000	0.35

(E) How simulation can be used as alternative for analysis of assembly line ? Explain. (05)

Q.2 (A) A boat company makes three different kinds of boats. All boats can be made profitably but the company's monthly production is constrained by limited amount of labour, wood and screws available each month. The director will choose the combination of the boats that maximizes his revenue in view of the information given in the following table.

Input	Row Boat	Canoe	Kayak	Monthly availability
Labour(Hrs)	12	7	9	1260 Hrs
Wood(Board Feet)	22	18	16	19008 Board Feet
Screws(Kg)	2	4	3	396Kg
Selling Price (Rs)	4000	2000	5000	

i) Formulate the problem as LPP. (04)
ii) How many boats of each type are produced and what will be the resulting revenue. (08)

(B) The arrival rate of customers at a banking counter follows Poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 60 per hour. (08)
i) What is the probability of having 0 customer in the system?
ii) What is the probability of having 5 customers in the system?
iii) What is the probability of having 10 customers in the system?
iv) Also find the number of customers in the system and in the queue.

Q.3(A) Solve the following game using dominance property and find the game value. (10)

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

(B) Find the basic feasible solution of the following transportation problem by VAM method. Also find the optimal transportation plan. (10)

	1	2	3	4	5	Supply
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Demand	60	60	30	40	10	

Q.4(A) Explain the following (08)
(i) P-system and Q-system
(ii) Decision tree

(B) A small project is composed of 7 activities whose time estimates are listed below. (12)

Activity	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

i .Draw the project network and identify critical path.

ii. Find the expected duration and variance of each activity.

iii. What is the probability that the project will be completed

(a) At least 4 weeks earlier than expected time.

(b) No more than 4 weeks later than expected time.

iv. If the project due date is 19 weeks, what is the probability of not meeting due date. Given

Z	0.5	0.67	1.0	1.33	2.00
P	0.3085	0.2514	0.1587	0.0918	0.0228

Q.5(A) Four buildings (B1, B2, B3 and B4) are to be constructed by four different contractors (C1, C2, C3 and C4). Each contractor has submitted the bid for the four buildings. The bid amount has been shown below. The problem is to determine which building is to be awarded to each contractor; so as to keep the cost of construction of four building optimum. (10)

	Contractor			
Building	C1	C2	C3	C4
B1	48	48	50	44
B2	56	60	60	68
B3	96	94	90	85
B4	42	44	54	46

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(B) Solve the following LP problem (10)

Minimize $Z=20X_1 + 10X_2$

Subject to

$$X_1 + 2X_2 \leq 40$$
$$3X_1 + X_2 \geq 30$$
$$4X_1 + 3X_2 \geq 60$$

X_1 *and* $X_2 \geq 0$

Q.6 (A) A company manufactures 30 units per day. Sale of these items depends upon demand which has the following distribution: (10)

Sales (units)	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

Production cost and sales price of each unit are Rs.40 and Rs.50 respectively. Any unsold product is to be disposed off at a loss of Rs 15 per unit. There is penalty of Rs.5 per unit if the demand is not met. Using the following random numbers estimate the total profit / loss for the next ten days: 10, 99, 65, 99, 95, 01, 79, 11, 16, 20.

(B) The annual demand of a particular item by a company is 10,000 units. These items may be obtained from an outside supplier or subsidiary company. The relevant data for procurement of the item is given below. (10)

Costs	From outside supplier	From subsidiary company
Cost per unit	12	13
Cost of placing an order	10	10
Cost of receiving an order	20	15
Storage and all carrying costs per unit per annum	2	2

i. What purchase quantity and from which source would you recommend to procure?

ii. What should be the minimum total cost in that case?