

12/10/13

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45

B.E DEGREE (FULL TIME) ARREAR EXAMINATIONS, NOV/DEC2013  
 COMMON TO MECHANICAL AND MANUFACTURING ENGINEERING BRANCH  
 EIGHTH SEMESTER  
 REGULATION 2004/2008  
 ME 512 OPERATIONS RESEARCH/ME 9027 MANAGEMENT SCIENCE

TIME: 3 HRS

MAX.MARKS: 100

ANSWER ALL QUESTIONS  
PART-A(10 X 2 = 20 MARKS)

1. Write down the general form of L.P problem.
2. State the Duality theorem on LPP.
3. Distinguish between PERT and CPM.
4. What do you understand by Travelling salesman problem?
5. Define the terms Buffer stock.
6. Distinguish P and Q inventory systems.
7. What is Kendall notation?
8. Mention the various types of simulation.
9. What do you understand by minimax and maxmini principles?
10. Distinguish between individual and group replacements.

PART-B(16 x 5 = 80 MARKS)

11. Solve the following Linear programming problem using the results of its dual problem.

$$\begin{aligned}
 \text{Minimize } Z &= 24X_1 + 30X_2 \\
 2X_1 + 9X_2 &\geq 10 \\
 4X_1 + 9X_2 &\geq 15 \\
 6X_1 + 6X_2 &\geq 20 \\
 X_1 \text{ and } X_2 &\geq 0.
 \end{aligned}$$

12.(a) A project has the following activities with their durations

Activity	:	A	B	C	D	E	F	G	H
Time	:	1	2	2	2	4	1	4	8
Preceding activity	:	-	-	-	A, B	B,C	C	D	E, F,G

- (i) Draw the project network
- (ii) Calculate the total floats and indicate the critical path.
- (iii) What is the minimum project completion time?

(OR)

12.(b) ) Goods have to be transported from factories  $F_1, F_2, F_3$  to ware houses  $W_1, W_2, W_3, W_4$ . The transportation cost per unit, capacities of the factories and requirement of ware houses are given below. Obtain the optimal solution to minimize the transportation cost.

Factories	Ware houses				Capacity
	$W_1$	$W_2$	$W_3$	$W_4$	
$F_1$	2	3	11	7	6
$F_2$	1	0	6	1	1
$F_3$	5	8	15	9	10
Requirements	7	5	3	2	

13. (a) Assume that the following quantity discount schedule for a particular bearing is available to a retail store.

Order size	Discount (%)
0-49	0
50-99	5
100-199	10
200 and above	12

The cost of a single bearing with no discount is Rs 30. The annual demand is 250 units, ordering cost is Rs 20 per order and annual inventory carrying cost is Rs 4 per unit. Determine the optimal order quantity and the associated minimal total cost of inventory and purchasing cost, if shortages are not allowed.

(OR)

(b) The annual demand of a product is 36000 units. The average lead time is 3 weeks. The standard deviation of the demand during the average lead time is 150 units/week. The cost of ordering is Rs 500 per order. The cost of purchase of the product per unit is Rs 15. The cost of carrying per unit per year is 20% of the purchase price. The maximum delay in lead time is 1 week and the probability of the delay is 0.3. Assume a service level of 0.95.

(i) What is re-order level if Q system is followed?

(ii) What is the maximum inventory level, if P system is followed?

14. (a) Goods trucks arrives randomly at a stock yard with a mean of 8 trucks/hour. A crew of four operators can unload a truck in 6 minutes. Trucks waiting in queue to be unloaded are paid a waiting charge at the rate of Rs 60 per hour. Operators are paid a wage rate Rs 20 per hour. It is possible to augment the crew strength to 2 or 3 (of four operators per crew) when the unloading time will be 4 minutes or 3 minutes respectively per truck. Find the optimal crew size.

(OR)

14. (b) ) A super market has two girls running up sales at the counters. If the service time for each customer is exponential with mean 4 minutes, and if people arrive in a poisson fashion at the rate of 10 an hour. (i) What is the probability of having to wait for a service? (ii) What is the expected percentage of idle time for each girl?

15.(a) Reduce the following 2x 3 game graphically

	Player B		
	1	3	11
Player A	8	5	2

(OR)

15. (b) A group process plant in an oil refinery is fitted with valves. Over a period of time, it has been observed that the failure pattern of 400 of these valves is

Month	:	1	2	3	4	5	6	7	8
Number of failures:		8	20	48	104	120	56	32	12

If there are 500 valves and they cost Rs 50 each to replace individually and Rs 25 each to replace on a planned group maintenance system, what is the least expensive programme?