Reg. No. : | | | | | | | | | | | |

Question Paper Code : S 4716

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Eighth Semester

Mechanical Engineering

ME 436 — OPERATIONS RESEARCH

(Regulation 2001)

Time : Three hours Maximum : 100 marks

Use of statistical tables is permitted

Answer ALL questions

PART A — (10 × 2 = 20 marks)

1. Distinguish between transportation problem and assignment problem.

2. Explain feasible solution.

3. What is optimistic time?

4. What is the use of dummy activity in a network?

5. How will you determine the reorder level of a deterministic inventory model?

6. What are the costs associated with inventory?

7. Give some applications of queuing theory.

8. What are the advantages of simulation technique?

9. Name any four applications of OR models in real life.

10. What are the applications of replacement policy?

PART B — (5 × 16 = 80 marks)

11. (a) A hospital provides free medical service to the patients on every morning. There are 3 doctors on duty, who are equally qualified and experienced. It takes, on an average 20 minutes for a patient to get treatment, and the actual time taken is known to vary approximately exponentially around this average. The patients arrive according to the Poisson distribution with an average of 5 per hour. Determine the following :

(i) The expected number of patients waiting in the queue

(ii) The average time that a patient spends at the hospital.

Or

(b) (i) Explain the following variables :

(1) Slack variable

(2) Surplus variable

(3) Artificial variable. (3 × 2 = 6)

(ii) Solve the following L.P. Problem graphically : (10)

Maximize $z = 60x_1 + 90x_2$

Subject to : $x_1 + 2x_2 \leq 40$

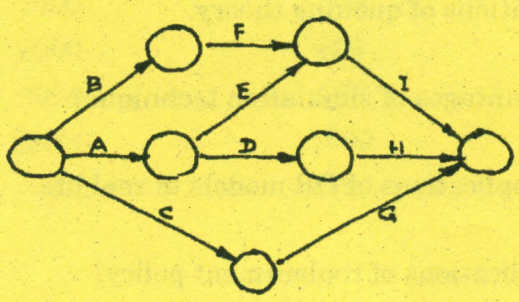
$2x_1 + 3x_2 \geq 90$

$x_1 - x_2 \geq 10$

$x_1, x_2 \geq 0$

12. (a) A project is represented by network. The activity times (in weeks) are given below :

Activity	A	B	C	D	E	F	G	H	I
Optimistic Time	5	18	26	16	15	6	7	7	3
Most Likely Time	8	20	33	18	20	9	10	8	4
Pessimistic time	10	22	40	20	25	12	12	9	5



Determine the following :

(i) Expected task times and their variances.

(ii) The earliest and latest occurrence times of each event.

(iii) The critical path

(iv) The probability of completing the project in 41.5 weeks.

Or

(b) Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees.

	A	B	C	D	E	Available
P	7	6	4	5	9	40
Q	8	5	6	7	8	30
R	6	8	9	6	5	20
S	5	7	7	8	6	10
Required	30	30	15	20	5	100

13. (a) From the data given below for the network, draw the network diagram. Crash the project to its minimum completion time. What is the completion time and cost for the crashed network?

Activity	Prerequisite Activities	Time (days)		Cost (Rs.)	
		Normal	Crash	Normal	Crash
A	–	40	35	12,000	16,000
B	A	20	10	300	600
C	A	30	15	500	800
D	B, C	50	40	600	1,000
E	C	30	25	1,000	2,000
F	D, E	0	0	–	–

Or

(b) A company has a demand of 12,000 units per year for an item and it can produce 2,000 such items per month. The cost of one set up is Rs. 400 and the holding cost/unit/month is Re. 0.15. Find the optimum lot size and the total cost per year, assuming the cost of 1 unit as Rs.4. Also find the maximum inventory, manufacturing time and total time.

14. (a) Records of 100 truck loads of finished jobs arriving in a department's check out area show the following: checking out takes 5 minutes and checker takes care of only one truck at a time. The data is summarized in the following table :

Truck inter arrivalTime(min) :	1	2	3	4	5	6	7	8	9	10
Frequency:	1	4	7	17	31	23	7	5	3	2

(Total : 100)

As soon as the trucks are checked out, the truck drivers take them to the next departments. Using Monte-Carlo simulation, determine:

(i) What is the average waiting time before service?

(ii) What is likely to be the longest wait?

Or

(b) In a railway Marshalling yard, goods trains arrive at a rate of 30 trains/day. Assuming that the inter arrival time follows and exponential distribution and the service time distribution is also exponential with an average 36 minutes, calculate the following :

(i) The mean queue size

(ii) The probability that the queue size exceed 10

(iii) If the input of trains increases to an average 33 per day, what will be the change in (i) and (ii).

15. (a) Players A and B play a game in which each player has three coins (one rupee, two rupees and five rupees) Each of them selects a Coin Without the knowledge of the other person If the sum of the values of the coins is even number, A wins B's coins. If that sum is an odd number, B wins A's coin.

(i) Develop a payoff matrix with respect to the Player A. (4)

(ii) Find the Optimal strategies for the Players. (12)

Or

(b) Following table gives the operation cost, maintenance cost and salvage value at the end of every year of a machine Whose purchase value is Rs. 20,000. Find the economic life of the machine assuming interest rate, i=15%

End of year (n)	Operation cost at the end of year	Maintenance cost at the end of year	Salvage value at the end of year
1	2000	200	10000
2	3000	300	9000
3	4000	400	8000
4	5000	500	7000
5	6000	600	6000
6	7000	700	5000
7	8000	800	4000
8	9000	900	3000
9	10000	1000	2000
10	11000	1100	1000