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B.Sc. (Applied Science) DEGREE EXAMINATION, MAY/JUNE 2006.

Fifth Semester

Apparel and Fashion Technology

FT 5.5 — OPERATIONS RESEARCH

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. When must MODI method be adopted?

2. What is zero-one programming?

3. Differentiate between PERT and CPM.

4. Why is resource leveling done?

5. Represent safety stock using a sketch.

6. Distinguish between probabilistic and deterministic models.

7. Differentiate between single and multi server models.

8. List the applications of simulation.

9. What is the role of rate of return in a replacement model?

10. What is a game of mixed strategies?

PART B — (5 × 16 = 80 marks)

11. Find the optimum order quantity for a product for which the price break-up is as follows :

Quantity	Unit cost (Rs.)
$0 \leq Q_1 < 500$	10.00
$500 \leq Q_2$	9.25

The monthly demand for the product is 200 units, the cost of storage is 2% of the units cost and the cost of ordering is Rs. 350.00.

12. (a) Solve to maximize $(Z) = 10x_1 + x_2 + 2x_3$

subject to $x_1 + x_2 - 2x_3 \leq 10$

$4x_1 + x_2 + x_3 \leq 20$

$x_1, x_2, x_3 \geq 0.$

Or

(b) Maximize $(Z) = 4x_1 + 3x_2$

subject to the constraints $x_1 + 2x_2 \leq 4$

$2x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$ and are integers.

13. (a) A project consists of nine jobs (*A, B, ... I*) with the following precedence relations and time estimates :

Jobs	Predecessor	Time (Days)
A	—	15
B	—	10
C	A, B	10
D	A, B	10
E	B	5
F	D, F	5
G	C, F	20
H	D, E	10
I	G, H	15

Draw the project network and identify the critical path.

Or

(b) The table below gives the time and cost for various activities of maintenance project :

Activity	Predecessor activity	Normal time	Crash time	Normal cost	Crash cost
		Days	Days	Rupees	Rupees
P	—	8	6	80	100
Q	*P*	7	4	40	94

Activity	Predecessor activity	Normal time	Crash time	Normal cost	Crash cost
		Days	Days	Rupees	Rupees
R	P	12	5	100	184
S	P	9	5	70	102
T	Q, R, S	6	6	50	50

Obtain the minimum cost schedule. Assume overhead cost as Rs. 25 per day.

14. (a) A ferry loads cars for delivering across a river and must have a full ferry load 10 cars. Loading may be assumed as instantaneous and round trip time is an exponential random variable with a mean of 15 minutes. The cars arrive at the shore as a Poisson process with mean of 30/hour. On the average, how many cars are waiting on the shore at any instant for a ferry?

Or

(b) Customers arrive at a milk booth for the required service. Assume that inter-arrival and service times are constant and given by 2 and 4 time units respectively. Simulate the system by hand computations for 16 time units. Assume the system starts at time = 0.

(i) What is the average waiting time per customer? (8)

(ii) What is the percentage idle-time of the facility? (8)

15. (a) A truck has been purchased at a cost of Rs. 1,60,000. The value of the truck is depreciated in the first three years by Rs. 20,000 each year and Rs. 16,000 per year thereafter. Its maintenance and operating costs for the first three years are Rs. 16,000, Rs. 18,000 and Rs. 20,000 in that order and increase by Rs. 4,000 every year. Assuming an interest rate of 10%, find the economic life of the truck.

Or

(b) Solve the following game :

		Player B			
		1	3	–3	7
Player A		2	5	4	–6