



PART B — (5 × 16 = 80 marks)

11. (a) Solve the following Linear Programming problem.

$$\text{Maximize } Z = 2x_1 + 4x_2 + x_3 + x_4$$

$$\text{Subject to } x_1 + 3x_2 + x_4 \leq 4$$

$$2x_1 + x_2 \leq 3$$

$$x_1 + 4x_3 + x_4 \leq 3$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

Or

- (b) Solve the following Linear programming problem.

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

$$\text{Subject to } 3x_1 - x_2 + 2x_3 \geq 7$$

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

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

$$x_1, x_2, x_3 \geq 0.$$

12. (a) Solve the given transportation problem [Table 12 (a)] to maximize the profit

Origin	Destinations				Supply
	1	2	3	4	
A	40	25	22	33	100
B	44	35	30	30	30
C	38	38	28	30	70
Demand	40	20	60	30	

Table12 (a)

Or

- (b) A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown in table 12(b). Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicles is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

Table 12 (b)

13. (a) The table 13 (a) gives the activities of a construction project and duration. Draw the network, find the critical path and compute the total, free and independent floats.

Activity	Duration
1-2	20
1-3	25
2-3	10
2-4	12
3-4	6
4-5	10

Table 13 (a)

Or

- (b) A project is composed of following activities as shown in table 13(b). Draw the network and find the critical path. Find the probability to complete the project 3 days later than the critical path time.

Activity	Duration (Days)		
	to	tm	tp
1-2	6	6	24
1-3	6	12	18
1-4	12	12	30
2-5	6	6	6
3-5	12	30	48
4-6	12	30	42
5-6	18	30	54

Table 13 (b)

14. (a) A manufacturer is offered two machines A & B. A has cost price of Rs.2500; its running cost is Rs.400 for each of the first 5 years and increases by Rs.100 every subsequent year. Machine B, having the same capacity as A costs Rs. 1250, has running cost of Rs.600 for 6 years increasing by Rs. 100 per year thereafter. If money is worth 10% per year which machine should be purchased?

Or

- (b) Solve the following sequencing problem shown in table 14 (b) when passing out is not allowed.

Job	Machine 1	Machine 2	Machine 3	Machine 4
1	15	5	4	15
2	12	2	10	12
3	16	3	5	16
4	17	3	4	17

Table 14 (b)

15. (a) Arrivals at a telephone booth are considered to be Poisson with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 3 minutes.
- What is the probability that an arrival will have to wait more than 10 minutes before the phone is free?
  - What is the probability that an arrival will take more than 10 minutes altogether to wait for phone and complete the call?
  - Find the average number of units in the system.
  - Find the probability that there will be 6 or more units waiting for the call.

Or

- (b) A repair shop attended by a single mechanic has an average of 4 customers per hour who bring small appliances for repair. The mechanic inspects them for defects and quite often can fix them right away or otherwise render a diagnosis. This takes him 6 minutes on the average. Arrivals are Poisson and service time has the exponential distribution. Find
- Probability of finding at least one customer in the shop.
  - Proportion of time during which the shop is empty.
  - Average number of customers in the system.
  - Average time spent by a customer including service.