M.B.A. DEGREE EXAMINATION, APRIL/MAY 2019.

Second Semester

BA 5201 — APPLIED OPERATIONS RESEARCH

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What is a Feasible solution in LPP?

2.   The dual of the dual problem is the primal problem. Why?

3.   What is an unbalanced assignment problem?

4.   What is a pure transient node in a transhipment problem?

5.   Why is it called a zero sum game in game theory?

6.   When can the graphical solution be applied in an IPP?

7.   What is meant by a quantity discount?

8.   What is risk?

9.   Mention any two queuing rules used.

10. What is discounted operating cost?

PART B — (5 × 13 = 65 marks)

11. (a)   Solve the following LPP Maximise $Z = 2x_1 + x_2$

Subject to : $x_1 + 2x_2 \le 10, x_1 + x_2 \le 6, x_1 - x_2 \le 2, x_1 - 2x_2 \le 1, x_1, x_2 \ge 0$.

Or

(b)   Solve the following LPP Minimise : $Z = 3x_1 + 2x_2$

Subject to : $5x_1 + x_2 \ge 10, x_1 + x_2 \ge 6, x_1 + 4x_2 \ge 12, x_1, x_2 \ge 0$.

12. (a) Minimise the transportation cost.

		Destination				Supply
		A	B	C	D	
Source	I	19	30	50	10	7
	II	70	30	40	60	9
	III	40	8	70	20	18
Demand		5	8	7	14	34

Or

(b) Assign Jobs to Men

		Men				
		I	II	III	IV	V
Jobs	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

13. (a) Solve the following IPP. Minimise $Z = 3x_1 + 2.5x_2$

Subject to : $x_1 + 2x_2 \geq 20$, $3x_1 + 2x_2 \geq 50$, $x_1, x_2 \geq 0$ and integers.

Or

(b) Solve the following game for the payoff matrix shown below

		Player B		
		B1	B2	B3
Player A	A1	20000	30000	60000
	A2	45000	45000	30000

14. (a) Find the optimum order quantity of an item for which the price breaks are as follows. The monthly demand for the item is 400 units, the cost of storage is 20% of the unit cost and ordering cost is Rupees 50 per order.

Quantity	Purchasing Cost
0 – 100	200
101 – 200	180
Above 200	160

Or

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(b) The demand for a bakery product is tabulated below based on previous data.

Daily demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Using the following random numbers simulate the demand for 10 days. Random numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49.

15. (a) A car washing unit has two cleaning bays manned by a three-man crew. Cars arrive at an average rate of 10 cars per hour and the arrival rate is Poisson distributed. The under chassis cleaning of a car takes 4 minutes on an average and can be assumed to be exponentially distributed. Determine the

(i) probability that a customer has to wait before being served,

(ii) expected percentage of idle time for each bay and

(iii) what is the expected waiting time for a car?

Or

(b) A pipeline is due for repairs. The repair would cost ₹. 10,000 and would last for three years, alternatively, a new pipeline can be laid at a cost of ₹. 30,000 which would last for 10 years. Assuming the interest rate to be 10% and ignoring salvage value, which is better alternative?

PART C — (1 × 15 = 15 marks)

16. (a) The Owner of a bus company is planning to provide accommodation for his crew. He has five buses which ply between Chennai and Coimbatore with three crew members in each return trip. The seating capacity in each bus is 50. The crew can either stay in Chennai or in Coimbatore. Suggest an appropriate decision model for this case where the crew can have a home to reside or a temporary place to stay during a trip. Show an illustration with hypothetical data. Make and state the assumptions regarding the time schedules of the trips.

Or

(b) Mr. Senthil has Rs. 10,000 invest in one of the three options. A, B or C. The return on his investment depends on whether the economy experiences inflation, recession or no change at all. His possible returns under each economic condition are given below :

State of Nature

Strategy	Inflation	Recession	No change
A	2000	1200	1500
B	3000	800	1000
C	2500	1000	1800

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What should he decide using the

   (i)   Maximax Criterion

  (ii)   Maximin Criterion

 (iii)   Regret Criterion

 (iv)   Hurwicz Criterion ($\alpha = 0.5$) and

  (v)   Laplace Criterion?