

Reg. No. _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER MCA DEGREE EXAMINATION, AUG 2017

RLMCA108: OPERATIONS RESEARCH

Max. Marks: 60.

Duration: 3 Hours

PART A

Answer all questions. Three marks each.

1. Define: Basic solution and Feasible solution
2. Solve graphically the LPP
 Maximise $z = 4x_1 + 6x_2$ subject to $x_1 + x_2 \leq 10, 3x_1 + x_2 \leq 15$
 Where $x_1 \geq 0, x_2 \geq 0$
3. Find an initial basic feasible solution by North West corner method.

	D	E	F	G	Availability
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

4. State the Maximin – Minimax principle.
5. Write symbolic representations of a queuing model and mention the meaning of each symbol.
6. What are the steps in the methodology of simulation?
7. State the Fundamental theorem of duality
8. How do simulated sampling method (Monte-Carlo method) used to evaluate the value of π ?

PART B

Answer one question from each module. Six marks each.

MODULE I

9. Suppose that you are investing Rs. 1,00,000/- in a combination of two shares A and B . The maximum investment allowed in either share is Rs. 75,000/-. Share A has an average rate of return of 10% and risk 40% whereas Share B has an average rate of return of 20% and risk 90%. You are not ready to accept rate of return below 12% and risk above 60%. Formulate this as a LPP and solve it graphically.
10. Use simplex method to solve the LPP *Maximise* $z = 4x_1 + 10x_2$ subject to the constraints
 $2x_1 + x_2 \leq 50, 2x_1 + 5x_2 \leq 100, 2x_1 + 3x_2 \leq 90$ where $x_1 \geq 0$ and $x_2 \geq 0$

MODULE II

11. Write the dual of the LPP and solve it. *Minimise* $z = 15x_1 + 10x_2$ subject to the constraints $3x_1 + 5x_2 \geq 5, 5x_1 + 2x_2 \geq 3$, where $x_1 \geq 0$ and $x_2 \geq 0$

12. Prove that the dual of the dual is the Primal problem.

MODULE III

13. Use Vogel's approximation method to obtain an IBFS of the transportation problem :

		Warehouse			Supply
		W1	W2	W3	
Factory	F1	16	20	12	200
	F2	14	8	18	160
	F3	26	24	16	90
Demand		180	120	150	

14. The Head of the Department has 5 jobs A, B, C, D and E and 5 subordinates V, W, X, Y and Z. The number of hours each person would take to perform each job is as follows. How should the jobs be allocated to minimize the total time?

	V	W	X	Y	Z
A	3	5	10	15	8
B	4	7	15	18	8
C	8	12	20	20	12
D	5	5	8	10	6
E	10	10	15	25	10

MODULE IV

15. Solve the following 2x2 game graphically.

		Player II			
		B1	B2	B3	B4
Player I	A1	2	1	0	-2
	A2	1	0	3	2

16. Two firms are competing for business under the condition so that one firm's gain is another firm's loss. Firm A's payoff matrix is given below:

		Firm B		
		No advertising	Medium advertising	High advertising
Firm A	No advertising	10	5	-2
	Medium advertising	13	12	15
	High advertising	16	14	10

Suggest optimum strategies for the two firms and the net outcome thereof.

MODULE V

17. Customers arrive at a one-man barber shop according to a Poisson process with a mean inter arrival time of 12 minutes. On the average, customers spend 10 minutes in the barber's chair.
- What is the expected number of customers in the shop?
 - What is the expected number of customers in the queue?
 - What is the probability of a customer walking directly to the barber's chair without waiting in the queue?
 - What is the average time customers spend in the queue?
 - What is the average time customers spend in the shop?
 - What is the probability that more than 3 customers are in the shop?
18. Patients arrive at a clinic according to a Poisson distribution at a rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. The examination time for a patient is exponentially distributed with a mean rate of 20 per hour.
- What is the effective arrival rate of patients at the clinic?
 - What is the expected number of patients in the waiting hall?
 - What is the expected number of patients in the clinic?
 - What is the probability of a patient walking directly to the doctor's room without waiting?
 - What is the expected waiting time of a patient in the clinic?
 - What is the expected waiting time of a patient in the waiting hall?

MODULE VI

19. a. What are the advantages of simulation?
b. What are the elements of simulation?
20. Customers arrive at a milk booth for the required service. Assume that the inter-arrival service times are constant and given by 1.8 and 4 time units, respectively. Simulate the system by hand computations for 14 time units.
- What is the average waiting time per customer?
 - What is the percentage idle time of the facility? (Assume that the starts at $t = 0$)
