I.M.C.A DEGREE EXAMINATION,, NOVEMBER 2023

Fifth Semester

Integrated MCA

Core - IMCA5C01 - OPERATIONS RESEARCH

2020 Admission onwards

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Time: 3 Hours   Maximum: 75 Marks

Part A

*Answer any **ten** questions*

*Each question carries **3** marks*

1.   What is opertaions Research?

2.   *Show that the solution to the following LPP is unbounded using Graphical Method.*

$$Max \ Z = 3X_1 + 2X_2$$

Sub to: $X_1 - X_2 >= 1$,

$X_1 + X_2 >= 3,$

$X_1 >= 0 , X_2 >= 0$

3.   Define Optimal solution.

4.   What are the characteristics of Dual?

5.   Write notes on North West Corner Rule.

6.   Cite any two areas where the assignment technique is applied.

7.   Define mixed strategy.

8.   What is mean by dominance property?

9.   What are the elements of the queing system?

10.   Discuss the concept of the "Poisson arrival process" and the "exponential service time distribution" in the context of the M/M/1 FIFO queuing model. Why are these assumptions commonly used in queuing theory?

11.   Cite some of the management applications of simulation.

12. Explain how simulation is useful in Queuing Problems.

<div align="right">(10×3=30 marks)</div>

Part B

*Answer **all** questions*

*Each question carries **9** marks*

13. a) A company produces two types of hats. Each hat of the first type requires twice as much labour as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits the daily sales of the first and second type as 150 and 250 hats. Assuming that the profits per hat are rs. 8/- for first type and rs. 5/- for second type, formulate the problem as a lp it order to determine the maximize profit.

<div align="center">OR</div>

b) Explain stepby step how a LPP is solved by Simplex Method.

14. a) *Find an initial Basic Feasible solution using vogel's method to the following transportation Problem.*

Source	Destination				
	1	2	3	4	Supply
I	21	16	15	3	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

<div align="center">OR</div>

b) *A company has four machines to do three jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is given in the following table.*

	1	2	3	4
A	18	24	28	32
B	8	13	17	19
C	10	15	19	22

What are job assignments which will minimize the cost?

15. a) *Given the pay off matrix for player A,obtain the optimum strategies for both the players and determine the value of the game*

	Player B		
	6	-3	7
Player A	-3	0	4

OR

b) *Assuming that the expected time are normally distributed,Find the critical path and project duration of*

Activity	Days		
	t_0	t_m	t_p
1-2	2	5	14
1-3	9	12	15
2-4	5	14	17
3-4	2	5	8
3-5	8	17	20
4-5	6	9	12

16. a) Explain characteristics of the queuing system.

b) A repairman to be hired to repair machines which break down at an average rate of 6 per hour. The breakdown follows Poisson distribution. The productive time of a machine is considered to cost Rs. 20 per hour. The repairmen, Mr. X and Mr. Y have been interviewed for this purpose. Mr. X charge Rs. 10 per hour and he services breakdown machines at the rate of 8 per hour. Mr. Y demands Rs. 14 per hour and he services at an average rate of 12 machines per hour. Which repairman should be hired ? (Assume 8 hour shift per day)

17. a) Discuss the importance of pseudo-random numbers in simulations and provide an overview of the Multiplicative Congruential Algorithm.

OR

b) A factory receives orders for 2, 3, 4, or 5 units with probabilities 0.2, 0.3, 0.4, and 0.1, respectively. Simulate the number of units ordered for the next 5 days using random numbers and find the average order size per day.

(5×9=45 marks)