Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester MCA (2 Year) Degree Examination December 2021

0520MCA261122101

Course Code: 20MCA261
Course Name: OPERATIONS RESEARCH

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 Explain the use of artificial variables in solving a linear programming problem. (3)

2 Obtain all the basic solutions to the following system of linear equation (3)

$$x_1 + 2x_2 + x_3 = 4$$
$$2x_1 + x_2 + 5x_3 = 5$$

3 State Complementary slackness theorem. (3)

4 Write the dual of (3)

Maximize $Z = x + 3y$

Subject to the constraints $4x + 2y \leq 3$

$6x + 5y \geq 4$

$x \geq 0, yisunrestricted$

5 Describe North West Corner method. (3)

6 What are the difference between a transportation and an Assignment problem? (3)

7 Construct a network diagram having the following constraints A,B and C start simultaneously A<D,I ; B<G,F ; D<G,F ; C<E ; E<H,K ; F<H,K ; G,H<J (W<X,Y means X and Y cannot start until W is completed) (3)

8 What are two common errors while drawing a network diagram? (3)

9 What is queue discipline? (3)

10 Explain single server queuing system. (3)

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

11 Solve by simplex method (6)

Maximize $Z = 5x + 3y$

Subject to the constraint $x + y \leq 2$

$5x + 2y \leq 10$

$3x + 8y \leq 12$

$x, y \geq 0$

OR

12 Minimize $Z = 5x + 6y$ (6)

Subject to the constraint $2x + 5y \geq 1500$

$3x + y \geq 1200$

$x, y \geq 0$

Module II

13 Prove that dual of a dual is primal. (6)

OR

14 Solve using duality principle (6)

Maximize $Z = 6x + 8y$

Subject to the constraint $5x + 2y \leq 20$

$x + 2y \leq 10$

$x, y \geq 0$

Module III

15 The cost of each job on each machine is given below .Determine the job assignments that will minimize the total cost. (6)

	Machine W	Machine X	Machine Y	Machine Z
Job A	18	24	28	32
Job B	8	13	17	18
Job C	10	15	19	22

OR

16 Use Vogel's Approximation method to obtain an initial basic feasible solution of the transportation problem and also compute the cost at the initial solution. (6)

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

Module IV

17 Explain Critical path analysis. (6)

OR

18 A small engineering project consists of nine activities. The three time estimates in number of days for each activity is given below. (6)

Activity	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
t_0	3	2	6	2	5	3	1	3	4
t_m	6	5	12	5	11	6	4	9	19
t_p	15	14	30	8	17	15	7	27	28

(i) Draw the network diagram.

(ii) What is the probability that the job will be completed in 31 days?

Module V

19 Explain birth-death process (6)

OR

20 On an average 96 patients per 24 hour day require the service of an emergency clinic .Also on an average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it cost the clinic Rs100/- per patient treated to obtain an average servicing time of 10 minutes and that each minute of decrease in this average time would cost Rs10/-per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $\frac{4}{3}$ patient to $\frac{1}{2}$ patient? (6)

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