JHARKHAND Rai University
RANCHI

End Semester/Reappear (Semester II) Examination May 2025

Programme: MBA
Course: Operation Research **Full Marks: 70**
Course Code:11.558 **Time: 3 Hrs.**
Enrolment no. _____

<table>
<tr><th>Q.No.</th><th>Questions</th><th>CO</th><th>Bloom Taxonomy Category</th><th>Marks</th></tr>
<tr><td colspan="5">Section I</td></tr>
<tr><td>1</td><td>Short Answer type questions.</td><td></td><td></td><td rowspan="10">4 x 5 = 20</td></tr>
<tr><td rowspan="3">a</td><td>Express mathematical and matrix form of L.P.P.</td><td>CO1</td><td>Understand</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Write short notes on (i) Types of variables in L.P.P. (ii) Basic solution of L.P.P.</td><td>CO1</td><td>Remember</td></tr>
<tr><td rowspan="3">b</td><td>Give mathematical formulation of the assignment problem.</td><td>CO2</td><td>Understand</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Define non – degenerate and degenerate solution with suitable diagram.</td><td>CO2</td><td>Remember</td></tr>
<tr><td rowspan="3">c</td><td>Discuss the characteristics of games.</td><td>CO3</td><td>Remember</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Define: Competitive game, pure strategies, Mixed strategies, two person zero sum game.</td><td>CO3</td><td>Remember</td></tr>
<tr><td rowspan="3">d</td><td>Explain the importance of sequencing problems.</td><td>CO4</td><td>Understand</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Discuss all four types of floats in project management.</td><td>CO4</td><td>Remember</td></tr>
<tr><td colspan="5">Section II</td></tr>
<tr><td></td><td>Long Answer type questions.</td><td></td><td></td><td rowspan="6">3 x 10 = 30</td></tr>
<tr><td rowspan="3">2</td><td>Using Simplex algorithm solve the given LPP
Using Simplex algorithm solve the given LPP
Maximize Z $= 2x_1 + 5x_2 + 7x_3$
Subject to constraints
$3x_1 + 2x_2 + 4x_3 \leq 100$
$x_1 + 4x_2 + 2x_3 \leq 100$
$x_1 + x_2 + 3x_3 \leq 100$
and $x_1, x_2, x_3 \geq 0$</td><td>CO1</td><td>Apply</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>Solve graphically the following linear programming problem.
Minimize Z = $3x_1+5x_2$
Subject to constraints
$-3x_1+4x_2 \leq 12$; $2x_1-x_2 \geq -2$; $2x_1+3x_2 \geq 12$; $x_1 \leq 4$, $x_2 \geq 2$; and $x_1, x_2 \geq 0$</td><td>CO1</td><td>Apply</td></tr>
<tr><td rowspan="3">3</td><td>Solve the given game by using the principle of dominance:
<table><tr><td rowspan="2">Player A</td><td colspan="7">Player B</td></tr><tr><td></td><td>I</td><td>II</td><td>III</td><td>IV</td><td>V</td><td>VI</td></tr><tr><td>1</td><td>4</td><td>3</td><td>0</td><td>2</td><td>1</td><td>1</td></tr><tr><td>2</td><td>4</td><td>3</td><td>1</td><td>3</td><td>2</td><td>2</td></tr><tr><td>3</td><td>4</td><td>3</td><td>7</td><td>-5</td><td>1</td><td>2</td></tr><tr><td>4</td><td>4</td><td>3</td><td>4</td><td>-1</td><td>2</td><td>2</td></tr><tr><td>5</td><td>4</td><td>3</td><td>3</td><td>-2</td><td>2</td><td>2</td></tr></table></td><td>CO3</td><td>Evaluate</td></tr>
<tr><td>or</td><td></td><td></td></tr>
<tr><td>A book binder has one printing press, one binding machine and one finishing machine and manuscripts of a number of different books. The time required for printing, binding, and finishing of each book is known. Determine the order in which the books be processed to minimize the total elapsed time.
<table><tr><td></td><td colspan="5">Processing Time (Minutes)</td></tr><tr><td>Book</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Printing Time</td><td>40</td><td>90</td><td>80</td><td>60</td><td>50</td></tr><tr><td>Binding Time</td><td>50</td><td>60</td><td>20</td><td>30</td><td>40</td></tr><tr><td>Finishing time</td><td>80</td><td>100</td><td>60</td><td>70</td><td>100</td></tr></table></td><td>CO3</td><td>Evaluate</td></tr>
</table>

4	A project has the following characteristics: a. Construct the network b. Compute earliest and latest time for each event (c) Find critical path.	CO4	Evaluate	
	or			
	A project schedule has the following characteristics: From the above information, you are required to – a. Construct a network diagram b. Compute the earliest event time and latest event time	CO4	Evaluate	
	Section III			
	Application based questions			
5	A small garment making unit has five tailors stitching five different types of garments. All the five tailors are capable of stitching all the five types of garments. The output per day per tailors and the profit (Rs.) for each type of garment are given below: (a) Which type of garment should be assigned to which tailor in order to maximize profit assuming that there are no other constraints? (b) If tailor D is absent for a specified period and no other substitute tailor is available what should be the optimal assignment?	CO2	Evaluate	**1 x 20 = 20**
	or			
	Discuss Modified distribution method. Hence find optimal solution to the following transportation problem in which the cell contains the transportation cost in rupees.	CO2	Evaluate	
	COURSE OUTCOME			

Activity	Time (weeks)		Activity	Time (weeks)
1 – 2	4		5 – 6	4
1 – 3	1		5 – 7	8
2 – 4	1		6 – 8	1
3 – 4	1		7 – 8	2
3 – 5	6		8 – 10	5
4 – 9	5		9 – 10	7

Activity	1 – 2	1 – 3	2 – 4	3 – 4	3 – 5	4 – 9	5 – 6	5 – 7	6 – 8	7 – 8	8 – 10	9 – 10
Time (Days)	5	2	3	2	7	6	5	9	2	3	6	8

	Garments				
Tailors	1	2	3	4	5
A	7	9	4	8	6
B	4	9	5	7	8
C	8	5	2	9	8
D	6	5	8	10	10
E	7	8	10	9	9
Profit/ garments	2	3	2	3	4

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	

After completing the course, students will be able to:

CO 1: Identify and develop operational research models from the verbal description of the realsystem using LPP and IPP.

CO 2: Understand the mathematical tools that are needed to solve optimization problems suchas Transportation and Assignment Problems.

CO 3: Use mathematical concept to solve the problems of Game theory and Sequencing.

CO 4: Integrate the knowledge of Inventory Management, Project Management &Replacement Models to take correct business decisions