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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Mechanical Engineering

Semester End Examination; June - 2017

Operations Research

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Define OR. List and explain various phases of OR. 8

b. Apply graphical method to solve the following problem :

Minimize $Z = 20x_1+10x_2$

Subject to $x_1+2x_2 \leq 40$

$3x_1+x_2 \geq 30$

$4x_1+3x_2 \geq 60, \quad x_1, x_2 \geq 0.$ 12

2 a. Describe the characteristics of OR. 8

b. Employ graphical method to solve the following problem :

Maximize $Z = 2x_1+x_2$

Subject to $x_1+2x_2 \leq 10$

$x_1+x_2 \leq 6$

$x_1-x_2 \leq 2$

$x_1-2x_2 \leq 1, \quad x_1,x_2,x_3 \geq 0.$ 12

UNIT - II

3. Solve the following LPP using two-phase method :

Maximize $Z = 5x_1-4x_2+3x_3$

Subject to $2x_1+x_2-6x_3 = 20$

$6x_1+5x_2+10x_3 \leq 76$

$8x_1-3x_2+6x_3 \leq 0$

$x_1, x_2, x_3 \geq 0.$ 20

4. Solve the following LPP using Big M method :

Maximize $Z = 2x_1+3x_2+4x_3$

Subject to $3x_1+x_2+4x_3 \leq 600$

$2x_1+4x_2+2x_3 \geq 480$

$2x_1+3x_2+3x_3 = 540$

$x_1, x_2, x_3 \geq 0.$ 20

Contd 2…

UNIT - III

5. Calculate the basic feasible solution of the following transportation problem by N-W corner rule and optimize the same. 20

Sources	Destinations					Supply
	1	2	3	4	5	
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Demand	60	60	30	40	10	

6. Solve the following transportation problem to find optimal solutions. 20

	D_1	D_2	D_3	D_4	D_5	Available
O_1	68	35	4	74	15	18
O_2	52	88	91	3	8	17
O_3	91	60	75	45	60	19
O_4	52	53	24	7	82	13
O_5	51	18	82	13	7	15
Required	16	18	20	14	14	

UNIT - IV

7 a. Why assignment problems are inherently degenerates? 4

b. Solve the following assignment problem : 16

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

8. An airline that operates 7 days a week has the time table shown below. Crew must have minimum layover of 5 hours between flights. Obtain the pairing of flights that result in smaller layover. 20

Delhi – Jaipur			Jaipur – Delhi		
Flight no.	Departure	Arrival	Flight no.	Departure	Arrival
1	7.00 a.m	8.00 a.m	101	8.00 a.m	9.15 a.m
2	8.00 a.m	9.00 a.m	102	8.30 a.m	9.45 a.m
3	1.30 p.m	2.30 p.m	103	12 noon	1.15 p.m
4	6.30 p.m	7.30 p.m	104	5.30 p.m	6.45 p.m

Contd 3…

UNIT - V

9 a. Explain the elements of a queuing system. 10

b. A self service store employs one cashier at its store. Nine customers arrive on an average every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, find :

i) Average number of customers in the system

ii) Average number of customers in the queue 10

iii) Average time customer spends in the system

iv) Average time consumer waits before being served.

10 a. Explain the following terms :

Pay off matrix, optimal strategy, saddle point, zero sum game. 8

b. Solve the following 2×5 game by graphical method : 12

		Player B				
		1	2	3	4	5
Player A	1	–5	5	0	–1	8
	2	8	–4	–1	6	–5

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