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B.E. (Part Time) End Semester DEGREE EXAMINATION, APR / MAY 2008

Third Semester

Industrial Engineering

6

PTIE 231 – OPERATIONS RESEARCH

PTIE 281 – DETERMINISTIC OPERATIONS RESEARCH

(Regulation 2002 / 2005)

(Use of Statistical table is permitted)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

**PART-A (10 x 2 = 20 Marks)**

1. State the applications of Operations Research.
2. What is basic feasible solution?
3. What is Degeneracy in transportation problems?
4. Write the concept of goal programming
5. Enumerate 'cut' in maximal flow problems.
6. What is Resource leveling?
7. What are the reasons for carrying inventories?
8. Describe briefly the VED ANALYSIS.
9. Distinguish between 'stage' and 'state' in Dynamic programming.
10. What are the characteristics of dynamic programming?

**PART B( 5 \* 16 = 80)**

11. Solve the following LPP using big-M method

$$\text{Minimize } Z = 4 X_1 + X_2$$

Subject to

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 3$$

and  $x_1, x_2 \geq 0$

(16 marks)

- 12.a. Consider the problem of assigning five operators to five machines. The assignment costs are given below:

	M1	M2	M3	M4	M5
A	7	7	-	4	8
B	9	6	4	5	6
C	11	5	7	-	5
D	9	4	8	9	4
E	8	7	9	11	3

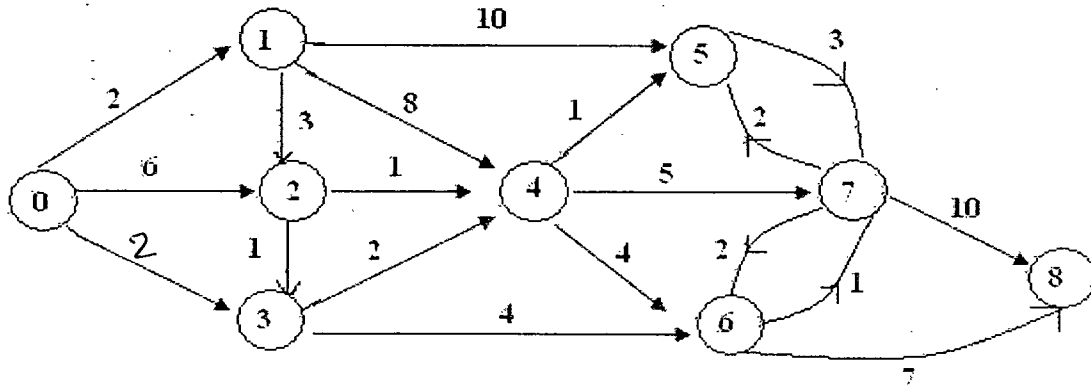
Operator A cannot be assigned to machine M3 and operator C cannot be assigned to machine M4. Find the optimum assignment schedule. (16 marks)

(or)

- b. A small furnishing company manufactures tables and chairs. Each chair requires 4 man hours of labour while each table requires 5 man – hours of labour. If only 40 man – hours are available each week and the owner of the company would neither hire additional labour nor utilize overtime, formulate the linear goal programming

problem and solve it. Both the table and the chair fetch a profit of Rs.2000 per week. Also he would like to supply 10 chairs, if possible, per week to a sister concern. (16 marks)

13.a. Find the shortest route from 0 to 8 by using the graphic method. The numbers on the links represent the distance in kilometers.



(16 marks)

(or)

b. Consider a project having the following activities and time estimates:

Activity	Immediate Predecessor	Expected time		
		Most optimistic	Most likely	Most pessimistic
A	-	3	4	5
B	-	4	8	10
C	B	5	6	8
D	A,C	9	15	10
E	B	4	6	8
F	D,E	3	4	5
G	D,E	5	6	8
H	D,E	1	3	4
I	G	2	4	5
J	F,I	7	8	10
K	G	4	5	6
L	H	8	9	13
M	J,K,L	6	7	8

- (i) Draw an arrow diagram for the project (6 marks)
- (ii) Compute the expected project completion time. (6 marks)
- (iii) What should be the due date to have 0.90 probability of completion? (4 marks)

14.a.(i) A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month's requirement at a time. Each part costs Rs.20. The ordering cost per order is Rs.15 and the carrying charges are 15 percent of the average inventory per year. You have been assigned to suggest a more economical policy for the company. What advise would you offer and how much would it save the company per year? (8 marks)

(ii) A contractor has to supply 20,000 units per day. He can produce 30,000 units per day. The cost of holding a unit in stock is Rs.3 per year and the set-up cost per run is Rs.50. How frequently, and of what size should the production runs be made?

(8 marks)

(or)

b. The consumption of an item is known to be fixed at 4800 units per year. The cost of processing an order for purchase of this item is Rs.400 and the inventory carrying charges work out to 24% per annum of the cost of the item. The cost of the item depends on the purchase lot size as per the schedule given below. Determine the optimum ordering policy.

Quantity per order	Cost per unit(Rs)
Upto 999	20.00
1000 – 1499	18.50
1500 and over	17.00

(16 marks)

15.a. A manufacture of golf balls is trying to determine the most effective advertising and promotional strategy for the introduction of its new line of golf balls. The company has budgeted Rs.5 lakhs for advertising. Listed below is the estimate of the potential sales revenue per Rs one lakh spent.

Medium	Expenditure(in lakhs)				
	1	2	3	4	5
Radio	0.90	0.80	2.70	3.60	4.50
TV	1.05	2.10	3.15	4.25	5.50
Magazine	1.10	2.05	3.20	4.20	5.10
Direct mail	0.85	1.95	3.50	4.40	5.60

All expenditures should be in increments of Rs one lakh. Determine the amount to be spent on the media.

(16 marks)

(or)

b. A drug manufacturing concern has ten medical representatives working in three sales areas. The profitability of each representative (in Rs thousands) in the three sales areas is as follows:

Area	No of representatives										
	0	1	2	3	4	5	6	7	8	9	10
1	15	22	30	38	45	48	54	60	65	70	70
2	26	35	40	46	55	62	70	76	83	90	95
3	30	38	44	50	60	65	72	80	85	90	85

Determine the optimum allocation of the medical representatives in order to maximize the profits. What will be the optimum allocation if the number of representatives available at present is only six?

(16 marks)