U.S.N

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

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Industrial and Production Engineering
Semester End Examination; Dec. - 2014
Operations Research

Time: 3 hrs   *Max. Marks: 100*

*Note: Answer any **FIVE** full questions, selecting at least **TWO** full questions from each part.*

PART - A

1. a. List down the phases of OR and explain them briefly.   10

   b. A manufacturer of a line of patent medicines is preparing a production plan on medicines A and B. These are sufficient Ingredients available to make 20000 bottles of A and 40000 bottles of B, but these are only 45000 bottles into which either of the medicine can be put. Furthermore, it takes 3 hours to prepare enough material to fill 1000 bottles of A it takes 1 hour to prepare enough material to prepare 1000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8 per bottle for A and Rs.7 per bottle for B. Find the optimal solution graphically.   10

2. a. What is slack and artificial variable? Explain with an example.   6

   b. Solve the following LPP by simplex method

   $Min \; Z = 2x_1 + 3x_2$
   S.T.
   $$x_1 + x_2 \geq 5$$
   $$x_1 - 2x_2 \geq 6$$
   $$x_1, \; x_2 \; \geq 0$$ 14

3. a. What is degeneracy in transportation problem? How do you resolve it? Explain.   5

   b. Alpha corporation has four plants each of which can manufacture anyone and four products. Product costs differ from one plant to another as do sales revenues. Given the revenue and cost data below, obtain which product each plant should produce Maximum profit   15

Production cost(Rs.1000's)					
		Product			
		1	2	3	4
Plant	A	49	60	45	51
	B	55	63	48	69
	C	52	62	49	68
	D	55	64	48	66

Sales Revenues (Rs.1000's)					
		Product			
		1	2	3	4
Plant	A	50	68	49	52
	B	60	70	51	74
	C	55	67	53	70
	D	58	65	54	69

4 a What is the difference between Transportation and Assignment problem?   5

   b. A manufacturer wants to ship 8 loads of his product as shown in the table. The matrix gives the milage from origin '0' to destination 'D' shipping costs are Rs. 10 per load per mile. What shipping schedule should be used?

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To

		D₁	D₂	D₃	Loads
From	O₁	50	30	220	1
	O₂	90	45	170	3
	O₃	250	200	50	4
	Loads	4	2	2	

PART - B

5 a. What is Queuing? Explain the characteristics of Queuing.   5

   b. A self service store employees are cashier at its counter. Nine customer arrive on an average every5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate & exponential distribution for service rate. Find

   (i) Average no. of customers in the system.   15

   (ii) Average time a customers in Queue.

   (iii) Average time a customer spends in the system

   (iv) Average time a customer wait before being spend.

6 a. What is the difference between PERT and CPM?   4

   b. What is expected time?   2

   c. The table below summarizing the details of a project consists of II activities.

Activity	Predecessors	Duration		
		a	m	b
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A,B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E,F	4	4	4
I	E,F	4	4	10
J	D,H	2	5	14
K	I,G	2	2	8

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i) Construct the project Network

ii) Find the expected duration and variance of each activity

iii) Find the initial path and the expected project completion time.

iv) What is the probability of completing the project on or before 25 weeks?

7 a. What is replacement? Explain different types of replacement.   5

   b. The failure rate of 1000 street bulbs in a colony are summarized in the table.

End of Month	1	2	3	4	5	6
Probability of failures to rate	0.05	0.20	0.40	0.65	0.85	1.00

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The cost of replacing an industrial bulbs is Rs. 60, if all the bulbs are replaced simultaneously it would cost Rs. 25/bulb. Find out the optimal replacement policy (Individual or group replacement)

8 a. What are the characteristics of game? Explain.   5

   b. Solve the following game problem graphically.

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Player B

		I	II	III
Player A	I	1	3	11
	II	8	5	2

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