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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH5DELB1 **Max Marks: 100**
Course: Operations Research **Date: 01.03.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Define operations research. Briefly discuss the phases of operations research. **08**

b) A manufacturer of a line of patent medicines has to prepare a production plan on medicine A and B. There are sufficient ingredients available to make 20,000 bottles of A and 40,000 bottles of B, but there are only 45,000 bottles into which either of the medicines can be put. Furthermore, it takes 3 hours to prepare enough material to fill 1,000 bottles of A, it takes one hour to prepare enough material to fill 1,000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8 per bottle of A and Rs. 7 per bottle of B. **12**

i) Formulate this problem as an LPP to maximize the profit.

ii) Solve it graphically.

UNIT - II

2 a) The owner of a small machine shop has four machines available to assign job for the day. Five jobs are offered with expected profit as follows: **10**

		Jobs				
		A	B	C	D	E
Machine	I	62	78	50	111	82
	II	71	84	61	73	59
	III	87	92	111	71	81
	IV	48	64	87	77	80

Find the assignment of machines to the jobs that will result in a maximum profit.

b) A machine operator processes five types of items on his machine each week, and must choose a sequence for them. The setup cost per change depends on the item presently on the machine and the setup to be made according to the following table: **10**

		To				
Machine		A	B	C	D	E
From	A	∞	4	7	3	4
	B	4	∞	6	3	4
	C	7	6	∞	7	5
	D	3	3	7	∞	7
	E	4	4	5	7	∞

If he processes each type of item once and only once each week, how should he sequence the items on his machine in order to minimise the total setup cost?

UNIT - III

3 a) Obtain an initial basic feasible solution to the following transportation problem by the following methods and thereby state the inference. **12**

i) North west corner method

ii) Least cost method

iii) Vogel's approximation method

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

b) What is degeneracy in transportation problem? How is it resolved? **08**

OR

4 a) A corporation has three manufacturing plants 1,2 and 3 which can produce one or all the four different products A, B, C and D. Different variable cost at each plant result in variable unit profit as given in the table below. Determine the quantity of products that should be manufactured at each plant so that the total profit is maximised. **16**

		Products				
Plants		A	B	C	D	Capacity
	1	22	26	20	21	450
	2	21	24	20	19	300
	3	18	20	19	20	250
	Demand	200	300	150	270	

b) List the assumptions made in transportation problem. **04**

UNIT - IV

5 a) Use graphical method to obtain the sequencing of jobs and machines and find the total elapsed time and idle time of each job. **12**

Job1	Sequence	A	B	C	D	E
	Time(hrs)	1	2	3	5	1
Job 2	Sequence	C	A	D	E	B
	Time(hrs)	5	4	3	2	6

b) Explain the Johnson's algorithm step by step. **08**

UNIT - V

6 a) Consider the following data for activities in a given project. **16**

Activity	A	B	C	D	E	F	G	H	I	J
Preceding Activity	-	A	A	A	B, C, D	A	D	A	H	G
Duration (Weeks)	3	6	4	3	1	4	5	5	1	2

i) Draw the PERT network of the project
ii) Identify the critical path and project duration
iii) Find the early and late start schedule for all activities in the project.

b) Differentiate between CPM and PERT. **04**

OR

7 a) A project has the following characteristics **15**

Activity	**Most optimistic Time (a)**	**Most pessimistic time (b)**	**Most likely time (m)**
1-2	1	5	1.5
2-3	1	3	2
2-4	1	5	3
3-5	3	5	4
4-5	2	4	3
4-6	3	7	5
5-7	4	6	5
6-7	6	8	7
7-8	2	6	4
7-9	5	8	6
8-10	1	3	2
9-10	3	7	5

1. Draw the network
2. Calculate the expected variances for each activity
3. Find the expected project completion time
4. Calculate the probability that the project will be completed at least 3 weeks than expected

b) Define optimistic time, most likely time, pessimistic time, probability and critical time. **05**

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