2021 SCHEME

Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN										

Course Code | 2 | 1 | M | E | 8 | 1 |

Eighth Semester B.E. Degree Examinations, April/May 2025

OPERATIONS RESEARCH

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions, choosing* ONE *full question from each module.***
2. Missing data, if any, may be suitably assumed

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		Module-1		
1.	**a.**	Define operations research. Discuss its scope.	**08**	**(1:1:1.6.1)**
	b.	A farmer has 200 acres of acres of land in which he can grow tomato, potato and radish what all he can grow can be sold in market he can gets Rs. 8/- per kg of tomato, Rs. 10/- per kg of potato and Rs. 12/- per kg of radish, the average yield per acre is 2000 kg of tomato 2500 kg of potato and 1500 kg of radish. Fertilizer requited for tomato potato and radish per acre is 100 kg, 125 kg and 150 kg respectively. The cost of fertilizer is Rs. 10/- per kg, labour required for sowing, cultivating and harvesting per acre is 25, 30 and 35 man days for tomato, potato, radish. A total of 600 man days are available at Rs. 100/- per day. Formulate this as an LPP model to maximize the profit.	**12**	**(2:1:1.6.1)**
		(OR)		
2.	**a.**	Explain slack, surplus and artificial variables.	**06**	**(2:1:1.6.1)**
	b.	Solve the following LPP by graphical method. $\mathbf{Z_{max} = 3X_1 + 4X_2}$ Subject to constraints: $\mathbf{X_1 + X_2 \leq 450}$ $\mathbf{2X_1 + X_2 \leq 600}$ $\mathbf{X_1 , X_2 \geq 0}$	**14**	**(2:1:1.6.1)**
		Module-2		
3.	**a.**	Explain clearly unbalanced transportation problem with example.	**05**	**(1:2:1.6.1)**
	b.	Find the initial solution by using VAM and optimize by MODI method.	**15**	**(2:2:1.6.1)**

Destination\ Origin	W1	W2	W3	W4	Supply
F1	2	3	11	7	6
F2	1	0	6	1	1
F3	5	8	15	9	10
Demand	7	5	3	2	

(OR)

4.	**a.**	List any five differences between transportation and assignment problems.	**05**	**(1:2:1.6.1)**
	b.	A sales man has to visit five cities 1, 2, 3, and 4 and he does not want to visit same city twice before completing tour of all cities and wishes to come back to city from where he has started cost of going city to another in Rs is given in following matrix. Find least cost rout.	**15**	**(2:2:1.6.1)**

	1	2	3	4
1	-	3	8	5
2	4	-	14	3
3	4	5	-	2
4	7	8	13	-

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)

Module-3

5. **a.** Define (i) Normal time (ii) Crash time (iii) Free float **06** **(1:3:1.6.1)**

b. A project consists of the following jobs and their duration. **14** **(2:3:1.6.1)**

Activity	Precedence	Duration (in days)
A	--	8
B	--	10
C	--	8
D	A	10
E	A	16
F	B,D	17
G	C	18
H	C	14
I	G,F	9

(i) Draw a network diagram (ii) Identify the critical path
(iii) Find the project duration (iv) Find earliest and latest start and finish time for each activity.

(OR)

6. **a.** Explain the basic steps in PERT / CPM techniques. **06** **(1:3:1.6.1)**

b. The following table gives the activities in a construction project and other information:- **14** **(2:3:1.6.1)**

Activity	t_o	t_m	t_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(i) Draw a PERT network (ii) identify the critical path and all the critical activities (iii) Expected completion time of the project.

Module-4

7. **a.** Describe the characteristics of queuing models. **06** **(1:4:1.6.1)**

b. In a railway yard goods trains arrive at a rate of 30 train per day .assuming that the inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes compute **14** **(2:4:1.6.1)**
(i) The average number of train in the system
(ii) The probability that the queue size exceeds 10
If the input trains increases to an average 33 per day, what will be the change in number of trains in queue and the probability that the queue size exceeds 10.

(OR)

8. **a.** Explain characteristics of game theory. **06** **(1:4:1.6.1)**

b. Solve the game graphically whose pay off matrix for the player A is given in the table. **14** **(2:4:1.6.1)**

	I	II
I	2	4
II	2	3
III	3	2
IV	-2	6

Module-5

9. **a.** List the assumptions made while dealing with sequencing problems. **06** **(2:5:1.6.1)**

b. Find the total elapsed time using the ABC in order. Find the optimum sequence of jobs, minimum elapsed time and ideal time for each machine **14** **(2:5:1.6.1)**

Job	A	B	C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

(OR)

10. **a.** State the assumptions of Johnson's algorithm. **06** **(2:5:1.6.1)**

b. Use the graphical method to minimize the time needed to process the following jobs on the machines shown below i.e. for each machine find the job which should be done first. Also calculate the total time needed to complete both the jobs. **14** **(2:5:1.6.1)**

Job 1	**Sequence of Machines:**	**A**	**B**	**C**	**D**	**E**
	Time	**3**	**4**	**2**	**6**	**2**
Job 2	**Sequence of Machines:**	**C**	**A**	**D**	**E**	**B**
	Time	**5**	**4**	**3**	**2**	**6**

** ** **

Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)