



CBCS SCHEME

21ME753

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define OR. Explain the different phases of OR.	10	L1	CO1
	b.	A firm manufactures two types of products A and B and sells them at a profit of Rs.2 on any type A and Rs.3 on any type B. Each product is processed on two machines G and H. Type A requires 1 minute of processing time on G and two minutes on H. Type B requires 1 minute on G and one minute on H. The machine G is available for not more than 400 minutes while machine H is available for 600 minutes during any working day. Formulate the problem as LPP.	10	L3	CO1
OR					
Q.2	a.	Explain the different applications of OR.	10	L1	CO1
	b.	Solve graphically the following LPP: Min $Z = 10x_1 + 4x_2$ Subject to $3x_1 + 2x_2 \geq 60$ $7x_1 + 2x_2 \geq 84$ $3x_1 + 6x_2 \geq 72$ and $x_1, x_2 \geq 0$	10	L2	CO1
Module – 2					
Q.3	a.	Define slack, surplus and artificial variables.	6	L1	CO2
	b.	Solve the following LPP by simplex method Max $Z = 3x_1 + 2x_2$ Subject to $x_1 + x_2 \leq 4$ $x_1 - x_2 \leq 2$ and $x_1, x_2 \geq 0$	14	L2	CO2
OR					
Q.4		Solve the following LPP by using Big-M method Max $Z = -2x_1 - x_2$ Subject to $3x_1 + x_2 = 3$, $4x_1 + 3x_2 \geq 6$ $x_1 + 2x_2 \leq 4$ and $x_1, x_2 \geq 0$	20	L2	CO2
1 of 3					

Module – 3

Q.5 **a.** Define Transportation problem. **2** **L1** **CO3**

b. Determine the optimum solution to the following transportation problem.

	D ₁	D ₂	D ₃	D ₄	Available
O ₁	1	3	1	4	30
O ₂	3	3	2	1	50
O ₃	4	2	5	9	20
Required	20	40	30	10	

18 **L2** **CO3**

OR

Q.6 **a.** Differentiate between Transportation and Assignment problem. **8** **L1** **CO3**

b. Solve the following assignment problem :

	1	2	3	4
I	2	3	4	5
II	4	5	6	7
III	7	8	9	8
IV	3	5	8	4

12 **L2** **CO3**

Module – 4

Q.7 **a.** Define : **8** **L1** **CO4**

- i) Activity
- ii) Event
- iii) Total float
- iv) Free float

b. A project has the following time schedule :

Activity	1-2	1-3	1-4	2-5	3-6	3-7
Duration	2	2	1	4	8	5

Activity	4-6	5-8	6-9	7-8	8-9
Duration	3	1	5	4	3

Construct the network and compute

- i) Total float for each activity
- ii) Critical path and its duration

12 **L3** **CO4**

OR

Q.8	a.	Explain the characteristics of queuing model.	8	L2	CO4
	b.	In a hair dress saloon with one barber, the customer arrival follows poisson distribution at an average rate of one every 45 minutes the service time is exponentially distributed with a mean of 30 minutes Find: i) Average number of customers in saloon ii) Average waiting time of customer before service iii) Average idle time of barber iv) Probability that the customer has to wait for service v) Average number of customer in que	12	L3	CO4

Module – 5

Q.9	a.	Define: i) Two person zero sum game ii) Fair game iii) Saddle point iv) Value of game	8	L1	CO5																		
	b.	Solve graphically the following game whose pay off matrix for the player 'A' is <div><div>A</div><table><tr><td></td><td colspan="2">B</td></tr><tr><td></td><td>I</td><td>II</td></tr><tr><td>I</td><td>2</td><td>4</td></tr><tr><td>II</td><td>2</td><td>3</td></tr><tr><td>III</td><td>3</td><td>2</td></tr><tr><td>IV</td><td>-2</td><td>6</td></tr></table></div>		B			I	II	I	2	4	II	2	3	III	3	2	IV	-2	6	12	L3	CO5
	B																						
	I	II																					
I	2	4																					
II	2	3																					
III	3	2																					
IV	-2	6																					

OR

Q.10	a.	Define sequencing problem. What are the assumption made while solving sequencing problem.	8	L1	CO5																								
	b.	There are five jobs each of which must go through machines A and B in the order AB. Processing times are given below: <table border="1"> <tr> <td></td><th colspan="5">Processing time in hours</th></tr> <tr> <th>Job</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr> <tr> <td>Time for A</td><td>5</td><td>1</td><td>9</td><td>3</td><td>10</td></tr> <tr> <td>Time for B</td><td>2</td><td>6</td><td>7</td><td>8</td><td>4</td></tr> </table> Determine total elapsed time and idle time for the machines.		Processing time in hours					Job	1	2	3	4	5	Time for A	5	1	9	3	10	Time for B	2	6	7	8	4	12	L3	CO5
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