

CBCS SCHEME

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17ME81

Eighth Semester B.E. Degree Examination, July/August 2021 Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. List and explain the phases of operations research. (08 Marks)
b. A diet of a sick person must contain atleast 4,000 units of vitamins, 50 units of minerals and 1400 calories. Two foods are available at a cost of Rs.4 and Rs.3 per unit respectively for A and B types. If food A contains 200 units of vitamins, 1 unit of mineral and 40 calories and if food B contains 100 units of vitamins, 2 units of mineral and 40 calories, formulate this problem as LPP model and solve it by graphical method to find the least cost with minimum requirement of the ingredients. (12 Marks)
- 2 a. Discuss the scope of operations research. (06 Marks)
b. Use graphical method to solve the following LPP.
Maximize $Z = 2x_1 + 3x_2$
Subjected to constraints (i) $x_1 + x_2 \leq 30$ (ii) $x_2 \geq 3$ (iii) $0 \leq x_2 \leq 12$
(iv) $0 \leq x_1 \leq 20$ (v) $x_1 - x_2 \geq 0$; $x_1, x_2 \geq 0$ (14 Marks)
- 3 a. What is the significance of introducing slack, surplus and artificial variables in LPP? (04 Marks)
b. Solve the following LPP by simplex method:
Maximize $Z = 4x_1 + 3x_2$
Subject to constraints (i) $2x_1 + x_2 \leq 1000$ (ii) $x_1 + x_2 \leq 800$ (iii) $x_1 \leq 400$ (iv) $x_2 \leq 700$ (16 Marks)
- 4 Solve the given problem using Big M method.
Maximize $Z = -2x_1 - x_2$
Subject to $3x_1 + x_2 = 3$, $4x_1 + 3x_2 \geq 6$, $x_1 + 2x_2 \leq 4$, $x_1, x_2 \geq 0$ (20 Marks)
- 5 a. What is degeneracy in transportation problem? Discuss how it can be overcome. (04 Marks)
b. L & T Company needs 3, 3, 4 and 5 million cubic feet of fill at 4 earthen dam sites I, II, III and IV in Karnataka. It can transfer the fill from 3 mounds A, B and C where 2, 6 and 7 million cubic feet of fill is available respectively. Costs of transportation for one million cubic feet of fill from 3 mounds to the 4 sites in lakhs of rupees are given in the table below (Table.Q5(b)). Determine the optimal transportation plan which minimizes cost to company.

		Sites			
		I	II	III	IV
Mounds	A	15	10	17	18
	B	16	13	12	13
	C	12	17	20	11

Table.Q5(b)

(16 Marks)

- 6 a. What do you understand by a balanced and unbalanced transportation problem? How an unbalanced problem is tackled? (06 Marks)

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- b. A product is produced by four factories A, B, C and D and their unit production costs in them are Rs.2, 3, 1 and 5 respectively. Their production capacities are factory A – 50 units, B – 70 units, C – 30, D – 50 units. These supply the products to four stores with their demands of 25, 35, 105 and 20 units respectively. Unit transportation cost from each factory to each store is given in Table.Q6(b). Determine the extent of deliveries from each factory to each store, so that total cost of production cum transportation is minimum.

		Stores			
		1	2	3	4
Factories	A	2	4	6	11
	B	10	8	7	5
	C	13	3	9	12
	D	4	6	8	3

Table.Q6(b)

(14 Marks)

7. A small project is composed of activities with their time estimates listed in Table.Q7.
- Draw project network
 - Find expected duration and variance of each activity and its expected project length
 - What is the probability of completing project:
 - Atleast 4 weeks earlier than expected.
 - If project is due in 19 weeks, what is the probability of meeting the due date?

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

Table.Q7

(20 Marks)

- State and explain in brief Kendall's notation for representing queuing models. (06 Marks)
 - A self service store employs one cashier at its counter. An average of 9 customers arrive every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution of arrival rate and exponential distribution of service rate find:
 - Average number of customers in system
 - Average number of customers in queue
 - Average time a customer spends in system
 - Average time a customer waits before being served. (14 Marks)
- Explain the following terms: (i) Pay off matrix (ii) Saddle point (iii) Fair game (06 Marks)
 - Use dominance rule to find the optimum strategies for both players.

	B_1	B_2	B_3	B_4	B_5	B_6
A_1	4	2	0	2	1	1
A_2	4	3	1	3	2	2
A_3	4	3	7	-5	1	2
A_4	4	3	4	-1	2	2
A_5	4	3	3	-2	2	2

(14 Marks)

- State assumptions made while applying Johnson's rule to n jobs on 2 machines. (06 Marks)
 - Use graphical method to minimize the time required to process the jobs. Details of processing time (hrs) and sequence given below:

Job 1:	A - 4, C - 2, D - 6, E - 3, B - 2
Job 2:	C - 8, A - 3, D - 4, B - 2, E - 3

Find sequence of jobs on each machine and total elapsed time for both jobs. (14 Marks)

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17ME82

Eighth Semester B.E. Degree Examination, July/August 2021 Additive Manufacturing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define additive manufacturing. Justify why additive manufacturing is so important in modern days. (07 Marks)
b. Explain the additive manufacturing process chain. (06 Marks)
c. Give the detailed classification of AM processes. (07 Marks)
- 2 a. With a neat sketch, explain the working principle of Stereolithography process. (08 Marks)
b. Discuss the post processing of AM parts. (07 Marks)
c. Write the applications of AM parts. (05 Marks)
- 3 a. Explain the importance of system drives and devices in AM machines. (06 Marks)
b. With a neat sketch, explain the working of DC electric motor. (07 Marks)
c. Give the detailed classification of hydraulic and pneumatic motors. (07 Marks)
- 4 Write short notes on :
 - i) Solenoids
 - ii) Diodes and Thyristors
 - iii) Triacs
 - iv) Piezoelectric actuators
 - v) Application of shape memory. (20 Marks)
- 5 a. Give the detailed classification of polymers. (04 Marks)
b. Explain the concept of
 - i) Functionality
 - ii) Polydispersity and molecular weight
 - iii) Molecular weight distribution (06 Marks)
c. Explain with neat sketch :
 - i) Wet Spinning
 - ii) Dry Spinning. (10 Marks)
- 6 a. Define Powder Metallurgy. Explain the different powder production techniques. (07 Marks)
b. Explain the importance particle size, and shape distribution, interparticle friction and compression ability on the quality of PM parts. (08 Marks)
c. Give the detailed applications of powder metallurgy. (05 Marks)
- 7 a. Explain with relevant sketches
 - i) Bottom – up
 - ii) Top down Approaches of nanotechnology. (06 Marks)
b. Explain the synthesis of nanomaterials
 - i) Solgel process
 - ii) Chemical Vapour Condensation (CVC) (08 Marks)
c. Give the applications of Nanotechnology. (06 Marks)

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- 8 a. With a neat sketch, explain Transmission Electron Microscopy (TEM). List the application. (10 Marks)
b. With a neat sketch, explain Atomic Force Microscopy (AFM) – List the application. (10 Marks)
- 9 a. Give the detailed classification of CNC machine tools. (10 Marks)
b. Explain the NC words used in manual part programming. (10 Marks)
- 10 a. Define Automation. Explain the basic elements of an automated system. (10 Marks)
b. Explain the need of Automation in productivity. (04 Marks)
c. Write short notes on :
i) Continuous and Discrete control
ii) Control System components. (06 Marks)

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17ME835

Eighth Semester B.E. Degree Examination, July/August 2021 Product Life Cycle Management

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. List the benefits of PLM. (10 Marks)
b. With neat sketch, explain PLM model. (10 Marks)
- 2 a. Explain the reasons for implementation of PDM system. (10 Marks)
b. Explain the phases of PLM. (10 Marks)
- 3 a. With neat sketch, explain the Design for X and Design centered development model. (10 Marks)
b. With neat sketch, explain Methodical Evolution in Product design. (10 Marks)
- 4 a. Explain with a graph strategies for recovery at end of life. (10 Marks)
b. Briefly explain Engineering Design. (10 Marks)
- 5 a. With neat sketch, explain various stages of New product development. (10 Marks)
b. Define Building decision support system. Explain components of DSS architecture. (10 Marks)
- 6 a. With flow chart, explain launching and tracking new product program. (10 Marks)
b. Explain Top – down and Bottom – up approach in new product financial control. (10 Marks)
- 7 a. Explain technology change with various stages. (10 Marks)
b. Explain the various Technology forecasting methods. (10 Marks)
- 8 a. Write short notes on Morphology methods. (10 Marks)
b. What is necessity of Technology forecasting? (10 Marks)
- 9 a. Write short notes on Digital mock up. (10 Marks)
b. What is 3D – CAD system and model building? (10 Marks)
- 10 a. Explain Variant Management. (10 Marks)
b. Explain Product data description and Data models. (10 Marks)

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