

CBCS SCHEME

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17ME81

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022

Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Operations Research. List and explain briefly various phases of operations research. (10 Marks)
- b. A factory manufactures a product each unit of which consists of 5 units of part A and 4 units of part B. The two parts A and B require different raw materials of which 120 units and 240 units respectively are available. These parts can be manufactured by three different methods. Raw material requirements per production run and the number of units for each part produced are given below:

Method	Input per run (units)		Output per run (units)	
	Raw material 1	Raw material 2	Part A	Part B
1	7	5	6	4
2	4	7	5	8
3	2	9	7	3

Formulate the LP model to determine the number of production runs for each method so as to maximize the total number of complete units of the final product. (10 Marks)

OR

- 2 a. Explain the limitations of operations research. (08 Marks)
- b. Solve the following LPP by graphical method and indicate the solution:
 Maximum value of $Z = 2x_1 + 3x_2$
 Subject to $x_1 + x_2 \leq 30$
 $x_2 \geq 3$
 $x_2 \leq 12$
 $x_1 - x_2 \geq 0$
 $0 \leq x_1 \leq 20$ (12 Marks)

Module-2

- 3 a. Define slack variable, surplus variable and artificial variable. (06 Marks)
- b. Solve the following by Big-M method:
 Minimize $Z = 2x_1 + x_2$
 Subject to $3x_1 + x_2 = 3$
 $4x_1 + 3x_2 \geq 6$
 $x_1 + 2x_2 \leq 3$
 $x_1, x_2 \geq 0$ (14 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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OR

- 4 a. Solve the following by simplex method for given LPP:

$$\text{Maximize } Z = 4x_1 + 10x_2$$

$$\text{Subject to } 2x_1 + x_2 \leq 10$$

$$2x_1 + 5x_2 \leq 20$$

$$2x_1 + 3x_2 \leq 18$$

$$x_1, x_2 \geq 0$$

(10 Marks)

- b. Solve the following LPP by Dual Simplex Method.

$$\text{Minimize } Z = 3x_1 + x_2$$

$$\text{Subject to } x_1 + x_2 \geq 1$$

$$2x_1 + 3x_2 \geq 2$$

$$x_1, x_2 \geq 0$$

(10 Marks)

Module-3

- 5 a. Write a brief note on Degeneracy in Transportation Problem. (08 Marks)
 b. Find the initial feasible solution to the transportation problem given below by North West Corner Rule and Least Cost Method. (12 Marks)

		Demand			
		D ₁	D ₂	D ₃	D ₄
Supply	S ₁	2	3	11	7
	S ₂	1	0	6	1
	S ₃	5	8	15	9
		7	5	3	2

OR

- 6 a. Solve the following transportation problem by using VAM technique. (08 Marks)

	D ₁	D ₂	D ₃	D ₄	D ₅	Supply
S ₁	4	2	3	2	6	8
S ₂	5	4	5	2	1	12
S ₃	6	5	4	7	3	14
Demand	4	4	6	8	8	

- b. Solve the following problem by MODI method (apply N-W corner rule for initial basic feasible solution) (12 Marks)

	D ₁	D ₂	D ₃	Supply
S ₁	2	7	4	5
S ₂	3	3	1	8
S ₃	5	4	7	7
S ₄	1	6	2	14
Demand	7	9	18	

Module-4

- 7 a. Define dummy activity in network analysis. Explain in brief AON and AOA diagrams. (08 Marks)
 b. Consider the following activity of a project:

Activity	A	B	C	D	E	F
Predecessor	–	A	A	B, C	–	E
Duration (weeks)	2	3	4	6	2	8

Draw the network diagram and find critical path and project duration.

(12 Marks)

OR

- 8 a. Explain the following:
- Kendall's notation for representing queueing models.
 - Pure birth process
 - Pure death process
- (08 Marks)
- b. A self service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find:
- Average number of customers in the system
 - Average number of customers in queue
 - Average time a customer spends in the system
 - Average time a customer waits before being served.
- (12 Marks)

Module-5

- 9 a. Apply the rules of dominance to reduce the game to (2×2) and solve the game to obtain game value and optimum strategies for both the players.
- (10 Marks)

	1	2	3	4
1	3	2	4	0
2	2	4	3	4
3	4	2	4	0
4	0	4	0	8

- b. Solve the following (2×4) game graphically:
- (10 Marks)

		Player B			
		1	2	3	4
Player A	1	2	2	3	-1
	2	4	3	2	6

OR

- 10 a. Find the sequence for the following eight jobs that minimizes the total elapsed time for completion of all jobs, each job being processed in the order CAB. Find the total elapsed time and idle time of each machine.

		Jobs							
		1	2	3	4	5	6	7	8
Machines	A	4	6	7	4	5	3	6	2
	B	8	10	7	8	11	8	9	13
	C	5	6	2	3	4	9	15	11

The entries give the time in hours on the machines.

(12 Marks)

- b. State the assumptions made while applying Johnson's rule to n jobs on 2 machines.

(08 Marks)

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Eighth Semester B.E. Degree Examination, Feb./Mar. 2022

Additive Manufacturing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Additive Manufacturing? (02 Marks)
- b. Explain Additive Manufacturing Process chain with a neat block diagram. (08 Marks)
- c. Explain with a neat sketch Stereolithography process. Write its advantages, disadvantages and applications. (10 Marks)

OR

- 2 a. List different post processing techniques of AM parts and explain briefly.
i) Support Material Removal ii) Aesthetic Improvements. (10 Marks)
- b. Write any Ten applications of AM in Aerospace, Defence, Automobile, Bio-Medical and General engineering. (10 Marks)

Module-2

- 3 a. Classify D.C. motors. Explain with a neat sketch the working of a D.C motor. (10 Marks)
- b. Explain briefly with neat sketches the following : i) Relays ii) Diodes. (10 Marks)

OR

- 4 a. Explain with a neat sketch the working of hydraulic vane motor. (06 Marks)
- b. Explain with a neat sketch the construction of a Double Acting cylinder pneumatic actuator. (06 Marks)
- c. Explain the importance of Shape Memory Alloys in additive manufacturing. (08 Marks)

Module-3

- 5 a. Define polymer. What are the classifications of polymers? (04 Marks)
- b. Explain with a neat sketch Wet Spinning method for additive manufacturing. (08 Marks)
- c. Write a note on Injection Moulding of polymers with a neat sketch. (08 Marks)

OR

- 6 a. List the mechanical methods of powder production. Explain with a neat sketch powder production by Ball Mill technique. (10 Marks)
- b. Explain in detail the Liquid Phase Sintering. (10 Marks)

Module-4

- 7 a. Explain with a neat sketch Bottom Up and Top Down approaches of synthesis. (10 Marks)
- b. Explain the principle of Transmission Electron Microscopy (TEM) with a neat sketch. What are its applications? (10 Marks)

OR

- 8 a. Explain with a neat sketch Chemical Vapour Condensation (CVC). (10 Marks)
- b. Explain the working principle of Atomic Force Microscopy (AFM) with a neat sketch. What are its limitations? (10 Marks)

Module-5

- 9 a. Enumerate various advantages and disadvantages of CNC machine tools. (10 Marks)
- b. Write a note on NC, CNC and DNC machine tools. (10 Marks)

OR

- 10 a. Explain with a block diagram basic elements of automated system. (10 Marks)
- b. Distinguish between Continuous Control and Discrete Control in manufacturing industries. (10 Marks)

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CBCS SCHEME

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17ME835

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022

Product Lifecycle Management

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What are the components of PLM? Explain the phases of PLM with a neat sketch. (10 Marks)
- b. Explain the opportunities and benefits of PLM. (10 Marks)

OR

- 2 a. Define PDM system. Explain the importance and reasons for implementing them in organization. (10 Marks)
- b. Briefly explain the basic components of a PDM system. (10 Marks)

Module-2

- 3 a. With an example, discuss the various steps involved in Engineering design. (10 Marks)
- b. Discuss the role of concurrent engineering in product design and development. (10 Marks)

OR

- 4 a. Explain the various strategies for Recovery at End of product life. (10 Marks)
- b. What is product recycling? Discuss the benefits of product recycling. (10 Marks)

Module-3

- 5 a. What is Decision Support System [DSS]? Discuss the components for building DSS. (10 Marks)
- b. Define New Product Development [NPD] and discuss the need for NPD. (10 Marks)

OR

- 6 a. Explain briefly Launching and Tracking of new product program. (10 Marks)
- b. Explain briefly the steps involved in product redesign. (10 Marks)

Module-4

- 7 a. Define Technology Forecasting. Briefly explain the different methods of technology forecasting. (10 Marks)
- b. Define Technological Change. Explain briefly its impact on society. (10 Marks)

OR

- 8 a. Briefly discuss the various methodologies and tools in product innovation. (10 Marks)
- b. Briefly explain relevance tree technique with a suitable example. (10 Marks)

Module-5

- 9 a. Discuss 3D-CAD system and Digital Mark-up tools used in virtual product development. (10 Marks)
- b. Briefly explain any two common techniques for analyzing virtual product models. (10 Marks)

OR

- 10 a. Explain briefly the concept of product configuration and its benefits. (10 Marks)
- b. Explain briefly the product data technology and its classification. (10 Marks)

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