CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   **15ME81**

Eighth Semester B.E. Degree Examination, June/July 2019
Operations Research

Time: 3 hrs.   Max. Marks: 80

Note: *1. Answer any FIVE full questions, choosing*
ONE full question from each module.
2. Use of statistical tables is permitted.

Module-1

1 a. List and explain briefly the phases of operations research. **(06 Marks)**

    b. A paper manufacturing company produces two grades of papers grade 'R' and grade 'S'. Because of raw material restrictions, not more than 450 tonnes of grade R and 240 tonnes of grade S papers can be produced per week. It requires 0.2 hours to produce 1 tonne of grade R paper and 0.4 hours to produce 1 tonne of grade S paper. There are 108 production hours per week. The profit per tonne of grade R paper is Rs 400 and per tonne of grade S paper it is Rs. 500. Formulate a mathematical model to determine how many tones of grade R and grade S papers the company has to produce per week to maximize its profit. Solve graphically. **(10 Marks)**

OR

2 a. Discuss the limitations of operations research. **(06 Marks)**

    b. Solve the following LPP by graphical method and indicate the solution :
Maximize $Z = 2x_1 + 3x_2$
Subject to constraints : $x_1 - 2x_2 \leq 0$
$$2x_1 - x_2 \geq 0$$
$$x_1 - x_2 \leq 0$$
with $x_1, x_2 \geq 0$. **(10 Marks)**

Module-2

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 $Z = 6x_1 + 4x_2$
Subject to constraints: $-2x_1 + x_2 \leq 2$
$$x_1 - x_2 \leq 2$$
$$3x_1 + 2x_2 \leq 9$$
with $x_1, x_2 \geq 0$. **(12 Marks)**

OR

4 a. Solve the following LPP by either Big–M method or two phase method :
Minimize $Z = x_1 - 2x_2 - 3x_3$
Subject to constraints : $-2x_1 + x_2 + 3x_3 = 2$
$$2x_1 + 3x_2 + 4x_3 = 1$$
with $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

    b. Solve the following by Dual Simplex Method :
Maximize $Z = -2x_1 - 2x_2 - 4x_3$
Subject to constrains: $2x_1 + 3x_2 + 5x_3 \geq 2$
$$3x_1 + x_2 + 7x_3 \leq 3$$
$$x_1 + 4x_2 + 6x_3 \leq 5$$
with $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

Module-3

5 a. What is degeneracy in transportation problem? Discuss its consequence and how it is over come. **(04 Marks)**

   b. Obtain the optimum solution to the following transportation problem to minimize the total transportation cost. Initial solution by Vogel's approximation method. (VAM).

		Destination				
		D_1	D_2	D_3	D_4	Supply
Origin	O_1	42	48	38	37	16
	O_2	40	49	52	51	15
	O_3	39	38	40	43	19
	Demand	8	9	11	16	

(12 Marks)

OR

6 a. Explain the differences between assignment problem and transportation problem. **(05 Marks)**

   b. A small machine shop has five jobs to be assigned to five machines. The following matrix indicates the cost of assigning each of the five jobs to each of the five machines. Obtain the optimum assignment of jobs to machines, in order to minimize the total assignment cost.

		Machines				
		1	2	3	4	5
Jobs	A	11	17	8	16	20
	B	9	7	12	6	15
	C	13	16	15	12	16
	D	21	24	17	28	26
	E	14	10	12	11	15

Q6(b) Cost Matrix **(11 Marks)**

Module-4

7 a. Explain the Kendall and Lee's notations for representing queuing models. **(04 Marks)**

   b. A small project consists of activities from 'A' to 'I'. The following table indicates the precedence relationship among activities and the three time estimates – optimistic, most – likely and pessimistic time for each activity in days.

Activity	Predecessor Relationship	Optimistic time 't_0'	Most likely time 't_m'	Pessimistic time 't_p'
A	–	2	5	8
B	A	6	9	12
C	A	6	7	8
D	B, C	1	4	7
E	A	8	8	8
F	D, E	5	14	17
G	C	3	12	21
H	F, G	3	6	9
I	H	5	8	11

   i)   Draw the project network. Determine the expected time and variance for each activity
   ii) Obtain the total expected duration of the project and critical path
   iii) What is the probability of completing the project in 50 days? **(12 Marks)**

OR

8 a. For the following set of activities of a project, draw the network and obtain Early Start [ES], Early Finish [EF], Late Start [LS] and Late Finish [LF] for each activity. Also, indentify the critical path and project duration.

Activity	Predecessor	Duration in days
A	–	5
B	A	8
C	A	6
D	C	5
E	B, D	9

(08 Marks)

b. The mean arrival rate to a service centre is 3 per hour. The mean service time is found to be 10 minutes per service. Assuming Poisson arrival and exponential service time, find :
   i)   Utilization factor for the service facility
   ii) Probability of two units in the system
   iii) Queue length
   iv) Expected waiting time in the system

(08 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.

Player B

		1	2	3
	1	2	–2	4
Player A	2	–1	4	2
	3	2	1	6

(08 Marks)

b. Solve the following (2×4) game graphically.

Player B

		1	2	3
	1	1	3	12
Player A	2	8	6	02

(08 Marks)

OR

10 a. There are seven jobs to be processed on a single machine. The following table indicates the jobs and corresponding processing time in hours. Obtain the optimum sequence of jobs by Shortest Processing Time [SPT] rule that minimizes the mean flow time. Also obtain average in process inventory. (06 Marks)

Jobs (j)	A	B	C	D	E	F	G
Processing time (t_j) in hr	8	3	5	4	3	9	6

b. There are six jobs to be processed on three machines A, B and C in the order CAB. The following table indicates the processing time in hours for the six jobs on the three machines. Obtain optimum sequence of jobs that minimizes the total elapsed time for completing all the jobs on the three machines. Also indicate the idle time of each machine.

Jobs	1	2	3	4	5	6
Processing time in hours on M/C A	4	6	7	4	5	3
Processing time in hours on M/C B	8	10	7	8	11	8
Processing time in hours on M/C C	5	6	2	3	4	9

(10 Marks)

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Eighth Semester B.E. Degree Examination, June/July 2019
Additive Manufacturing

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. Briefly explain the process chain of additive manufacturing.   (08 Marks)
   b. Explain discrete particle system.   (08 Marks)

OR

2 a. Explain the steps involved in property enhancement using thermal techniques.   (08 Marks)
   b. Write any eight applications of AM in Aerospace, Automobile, Medical and general engineering.   (08 Marks)

Module-2

3 a. With a neat sketch explain the working of hydraulic piston motors.   (08 Marks)
   b. With a simple pneumatic circuit explain the supply air throttling system.   (08 Marks)

OR

4 a. Classify Direct Current motors. With a neat sketch, explain the working of a DC motor.
                                                                             (08 Marks)
   b. Explain the working of diode in a circuit with neat sketches.   (08 Marks)

Module-3

5 a. How polymers are classified?   (02 Marks)
   b. Explain polydispersity and molecular weight distribution in polymers. (06 Marks)
   c. Write a short note on compression moulding of polymers with a neat sketch.   (08 Marks)

OR

6 a. List out the mechanical methods of powder production systems. Explain any one with a neat sketch.   (08 Marks)
   b. What are the stages of liquid phase sintering? Explain any one stage.   (08 Marks)

Module-4

7 a. Explain the bottom up and top down methods of synthesis.   (08 Marks)
   b. Explain the mechanical grinding methods of creating nano structures.   (08 Marks)
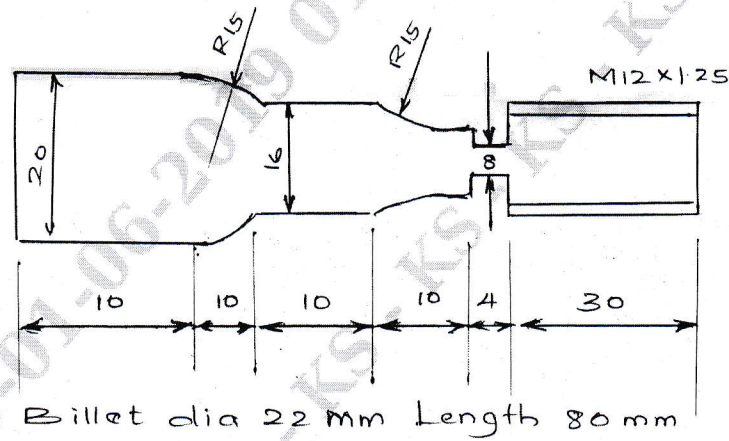
OR

8   a.   With a neat sketch, explain the working of transmission electron microscopy.   (08 Marks)
    b.   Explain the working principles of Atomic force microscopy.   (08 Marks)

Module-5

9   a.   List out the advantages of CNC machines over NC machines.   (08 Marks)
    b.   Write a part programming for the component shown in the Fig.Q9(b).   (08 Marks)

Fig.Q9(b)

OR

10   a.   Write down the benefits of automation.   (08 Marks)
     b.   Explain the different levels of automation with examples.   (08 Marks)

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Eighth Semester B.E. Degree Examination, June/July 2019
Product Life Cycle Management

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1   a.   Define PLM. List and explain the different phases of Product Life Cycle.   (06 Marks)
    b.   What is PLM Strategy? Explain.   (04 Marks)
    c.   List the benefits of PLM.   (06 Marks)

OR

2   a.   Sketch and explain the PLM has a holistic approach to the management of a product.   (06 Marks)
    b.   List and explain the various opportunities of PLM.   (06 Marks)
    c.   What do you mean by PLM feasibility study? Explain.   (04 Marks)

Module-2

3   a.   What is Engineering design? Explain.   (04 Marks)
    b.   Sketch and explain the product design process.   (06 Marks)
    c.   Sketch and explain the recovery strategies at end of life.   (06 Marks)

OR

4   a.   Sketch and explain the comparison between sequential and concurrent engineering in product development process.   (06 Marks)
    b.   List and explain the most common DFX techniques used in the product design and development process.   (06 Marks)
    c.   Explain the human factors to be considered in product design.   (04 Marks)

Module-3

5   a.   Sketch and explain the various activities of new product development.   (08 Marks)
    b.   How do you estimate the market potential of a new product? Explain.   (08 Marks)

OR

6   a.   What is Decision Support System? How it is helpful in decision making? Explain. (08 Marks)
    b.   With the aid of a flow chart, explain the process of launching and tracking of a new product.   (08 Marks)

Module-4

7   a.   Define Technology Forecasting. Explain why technology forecasting is important.   (08 Marks)
    b.   List and explain any one method of Technology Forecasting.   (08 Marks)

OR

8   a.   Sketch and explain the importance of 'Relevance Tree' by taking Automobile as an example.   (08 Marks)
    b.   List and explain the importance of ideation tools in the innovation process.   (08 Marks)

Module-5

9 a. What is Model building? How do you classify them? Explain.   (06 Marks)
   b. Explain the following :
       i) Product structures   ii) Digital mock – up.   (10 Marks)

OR

10 Explain the following :
    a. Data model.
    b. Product configuration.
    c. 3D CAD systems.
    d. Variant Management.   (16 Marks)

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