Total No. of Questions : **08** Roll No. : 0701...

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Mechanical Engineering)

ME-8301 COMPUTER INTEGRATED MANUFACTURING

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1 What is CIM? Explain CIM wheel. And write the advantages of CIM. ***14***

2 What is Product Life Cycle (PLC)? Explain its different stages. ***14***

3 Explain the Hardware and Software required for implementation of CIM in an industry. ***14***

4 Explain the following : ***14***

(i) Hard and Soft Prototype
(ii) Taguchi Method for Robust design

5 Explain the following transformation of geometry with an example : ***14***

(i) Rotation
(ii) Translation
(iii) Scaling

6 What do you mean by Bezier curve and B-spline curve? Write the differences between them. ***14***

7 What do you mean by NC, CNC and DNC? Write the meaning of following G and M codes with an example : ***14***

(i) G01 (ii) G41 (iii) G91 (iv) M03 (v) M05

8 Explain the different configuration of ROBOT with neat sketch. ***14***

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B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Mechanical Engineering)

ME-8302 OPERATIONS RESEARCH

Time : Three Hours | *Maximum Marks : 70*
Min. Pass Marks : 22

Note : Attempt any five questions. Questions carry equal marks. Assume suitable data, if required. Use of statistical tables is permitted.

1(a) Define following terms related to linear programming : ***04***
(i) Unbounded solution and it's determination in Simplex Tableau
(ii) Standard form of LP

(b) Solve by simplex method the following L.P. problem ***10***

Minimize $Z = X_1 - 3X_2 + 2X_3$

Subject to
$$3X_1 - X_2 + 2X_3 \leq 7$$
$$-2X_1 + 4X_2 \leq 12$$
$$-4X_1 + 3X_2 + 8X_3 \leq 10$$
$$X_1, X_2, X_3 \geq 0$$

2(a) What is a basic solution and why will you make (n-m) variables non basic to get initial basic feasible solution? Why n is always greater than m? ***04***

(b) A chemical company produces two compounds A and B. The following table gives the units of ingredients C and D per kg of compounds A and B as well as minimum requirements of C and D and cost per kg of A and B. Using the simplex method, find the quantities of A and B which would give a supply of C and D at minimum cost. ***10***

Ingredients	Compounds		Minimum Requirements
	A	B	
C	1	2	80
D	3	1	75
Cost per Kg ($)	4	6	

3(a) Why it is required that there should be (m+n-1) independent allocations to perform optimality test in a typical transportation problem? How will you deal if there are more than (m+n-1) allocations? ***04***

(b) A company has four different factories which supply warehouses A, B, C, D & E. Monthly factory capacities are 200, 175, 150 and 325 respectively. Monthly warehouse requirements are 110, 90, 120, 230 and 160 respectively. Unit shipping costs in $ are given in the following table. Shipments from 1 to B and from 4 to D are not possible due to broken bridges. Find the optimal total cost of transportation. ***10***

From \ To	**A**	**B**	**C**	**D**	**E**
1	13	--	31	8	20
2	14	9	17	6	10
3	25	11	12	17	15
4	10	21	13	--	17

4(a) Explain the customer behavior in a queue? Give suitable examples. ***04***

(b) A repairman is to be hired to repair machines which breakdown at an average rate of 6 per hour. The breakdown follows Poisson distribution. The nonproductive time of a machine is considered to cost Rs 20 per hour. Two repairmen Mr. X and Mr. Y have been interviewed for this purpose. Mr. X charges Rs 10 per hour and he services breakdown machines at the rate of 8 machines per hour. Mr. Y demands Rs 14 per hour for the servicing at an average rate of 12 per hour. Which repairman should be hired? (Assume 8 hours shift per day). ***10***

5(a) What are the differences between transportation and assignment model? Enlist various applications of assignment model. **04**

(b) A company is faced with the problem of assigning 4 machines to 6 different jobs (one machine to one job only). The profits are estimated as shown in table. What is the optimal assignment? **10**

Jobs Machine	M_1	M_1	M_1	M_1
A	3	6	2	6
B	7	1	4	4
C	3	8	5	8
D	6	4	3	7
E	5	2	4	3
F	5	7	6	4

6(a) Write six properties of the competitive game. **04**

(b) Solve the given game **10**

Player - B

Player - A	19	6	7	5
	7	3	14	6
	12	8	18	4
	8	7	13	- 4

7(a) Why three time estimates are considered in PERT? What is the basis for calculating mean time and variance of each activity? **04**

(b) Following table gives the activities and dependence relationships along with 3 time estimates in days of completion of these activities. **10**

Activity	Immediate Predecessor	Minimum Time	Likely Time	Maximum Time
A	--	4	8	10
B	A	2	8	24
C	A	8	12	16
D	A	4	6	10
E	B	1	2	3
F	E,C	6	8	20
G	E,C	2	3	4
H	F	2	2	2
I	F	6	6	6
J	D,G,H	4	6	12
K	I,J	2	2	3

Draw the network, number it and find expected time estimates for activities along with variances. Also find critical path and probability that the project will be completed in 36 days.

8(a) Show that the total cost of project follows a concave curve and thus it has a minima. **04**

(b) An insurance company has decided to modernize and refit one of its branch offices. The major jobs of the project have been identified as follows along with their durations and immediately preceding jobs : **10**

Job	A	B	C	D	E	F	G	H	I	J	K	L	M
Predecessor	E	A	B	K	--	E	F	F	F	I,L	C,G,H	D	I,L
Duration (weeks)	4	2	1	12	14	2	3	2	4	3	4	2	2

(i) Draw the network and find the critical path.
(ii) What is the total time required for completing this project?
(iii) Calculate the total, free and independent floats with the activities in the network diagram.

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Total No. of Questions : **08** Roll No. : 0701……………………………….

B.Tech EIGHTH SEMESTER EXAMINATION JUNE-2025

(Branch : Mechanical Engineering)

CS-8322 (OEL-II) DATA SCIENCE AND ANALYTICS

Time : Three Hours ***Maximum Marks : 70***
Min. Pass Marks : 22

Note : Attempt any five questions. Each question carries equal marks.

1(a) Describe real-life applications of Data Science in Healthcare, Finance and E-commerce industries.

(b) Explain the advantages of Data Science on various aspects like automation, personalization, efficiency, etc.

2(a) Explain the role of data mining in knowledge discovery. Also explain the key tasks of data mining : classification, clustering, and association rule mining

(b) What is Data Virtualization? How is data virtualization different from traditional data integration methods?

3(a) Differentiate between traditional Business Intelligence and modern Business Intelligence powered by data science.

(b) List the key features and advantages of using R for data analysis. Write an R script to perform basic arithmetic operations and store the result.

4(a) What are some common functions / packages used for bar chart visualization in R? Write a sample R script to plot monthly sales using a line chart.

(b) How do you read a CSV file into R? Explain how to handle missing data while reading a file in R.

5(a) What are the three main types of machine learning? Give real-world applications for each type of machine learning.

(b) Differentiate between classification and regression algorithms. List common algorithms used for classification and regression.

6(a) What is the main idea behind Support Vector Machines? Explain the concept of a hyper plane in SVM.

(b) How does a decision tree make predictions? Explain the concepts of entropy and gain information in decision trees.

7(a) Describe the basic structure of an artificial neural network. Differentiate between feed forward and recurrent neural networks.

(b) What are the advantages of Random Forest algorithm over other algorithms? Explain the concepts of bagging and feature randomness in Random Forest.

8(a) Describe the stages : problem identification, data collection, preprocessing, modeling, and evaluation while working on real-world data science projects.

(b) Explain how data science is used in object recognition systems. How does object recognition support applications like autonomous vehicles or facial recognition?

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