

**IV B.Tech I Semester Supplementary Examinations, February-2026
PROJECT MANAGEMENT AND OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)****Time: 3 Hours****Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

- | | Marks | CO | Blooms Level |
|---|-------|----|--------------|
| <u>UNIT-I</u> | | | |
| 1. a) What is the need for project management | 5M | 1 | 1 |
| b) Explain the principle of project management | 5M | 1 | 2 |
| (OR) | | | |
| 2. a) Explain the stages of project management | 5M | 1 | 2 |
| b) Explain any two project organisation structures | 5M | 1 | 2 |
| <u>UNIT-II</u> | | | |
| 3. a) Describe the components of capital cost of a project | 5M | 2 | 3 |
| b) Explain the sources of finance of a financial institute | 5M | 2 | 2 |
| (OR) | | | |
| 4. Explain the regulatory role of central banks in the functioning of financial institutions. | 10M | 2 | 2 |
| <u>UNIT-III</u> | | | |
| 5. Define PERT and CPM. Compare their features and applications in project management. | 10M | 3 | 2 |
| (OR) | | | |
| 6. a) Explain the procedure for identifying the critical path in a CPM network | 5M | 3 | 2 |
| b) Differentiate between total float, free float, and independent float. | 5M | 3 | 4 |
| <u>UNIT-IV</u> | | | |
| 7. a) List out the characteristics of operations research | 5M | 4 | 1 |
| b) Solve the following problem by graphical method | 5M | 4 | 3 |
| $\text{Max } Z = 3X_1 + 5X_2$ $\text{Subjected to constraints } X_1 + 2X_2 \leq 2000, X_1 + X_2 \leq 1500, X_2 \leq 600 \text{ and } X_1, X_2 \geq 0$ | | | |
| (OR) | | | |
| 8. There are seven jobs, each of which has to go through the machine A and B in the order AB. Processing times in hours are given below. | 10M | 4 | 3 |

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Solve the above problem for optimum sequence and total elapsed time

UNIT-V

9. If the values in the following matrix indicates unit profits Determine optimum transportation cost. 10M 5 5

	I	II	III	IV	Availability
A	90	90	100	110	200
B	50	70	130	85	100
Demand	75	100	100	30	

(OR)

10. A company has 5 jobs to be done. The following matrix shows the return in rupees on assigning i^{th} machine to the j^{th} job. Evaluate the total expected profit. 10M 5 5

Jobs						
Machines		A	B	C	D	E
	1	5	11	10	12	4
	2	2	4	6	3	5
	3	3	12	5	14	6
	4	6	14	4	11	7
	5	7	9	8	12	5

UNIT-VI

11. Solve the following rectangular game whose payoff matrix to A is given in table below: 10M 6 3

		B					
		I	II	III	IV	V	VI
A	I	0	0	0	0	0	0
	II	4	2	0	2	1	1
	III	4	3	1	3	2	2
	IV	4	3	7	-5	1	2
	V	4	3	4	-1	2	2
	VI	4	3	3	-2	2	2

(OR)

12. The maintenance cost and resale value of a machine for different years whose purchase price is Rs 7000 are given below. Determine the optimum replacement period of the machine. 10M 6 3

Year	1	2	3	4	5	6	7	8
Maintenance cost in Rs	900	1200	1600	2100	2800	3700	4700	5900
Resale value in Rs	4000	2000	1200	600	500	400	400	400

**Data Science with python
(INFORMATION TECHNOLOGY)**

Time: 3 Hours**Max Marks: 60**

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		Marks	CO	Blooms Level
<u>UNIT-I</u>				
1.	a) Specify the key components of Data Science and explain why neglecting any one of them can lead to project failure.	5	CO1	K2
	b) Discuss how Data Science differs from traditional data analysis. Illustrate with examples from at least two application domains.	5	CO1	K3
(OR)				
2.	Consider a healthcare organization planning to implement a Data Science-driven patient monitoring system. Discuss how you would handle the data acquisition, role assignment, and organizational challenges in such a project.	10	CO1	K4
<u>UNIT-II</u>				
3.	a) Explain boolean indexing with a simple example.	5	CO2	K2
	b) Write a code snippet to transpose a 2-D array.	5	CO2	K3
(OR)				
4.	Demonstrate NumPy's built-in methods for mean, median, variance, standard deviation, and cumulative sum on a sample dataset. Compare the results with equivalent Python built-ins.	10	CO2	K3
<u>UNIT-III</u>				
5.	Write code to read data from a CSV file, filter rows based on a condition, and write the resulting DataFrame to a new CSV file. Explain the key parameters used in read_csv() and to_csv().	10	CO3	K4
(OR)				
6.	Show how apply(), applymap(), and map() work in Pandas with code examples on a Series and a Data Frame. Explain the differences between them.	10	CO3	K4
<u>UNIT-IV</u>				
7.	Write code to transform a column of numeric codes into category names using a dictionary mapping. Compare this with using apply() and a custom function.	10	CO4	K4
(OR)				
8.	Create a numeric Series with some extreme values. Show how to compute z-scores or use conditional filtering to detect and remove outliers.	10	CO4	K4
<u>UNIT-V</u>				
9.	a) Differences between pivot() and pivot_table()	5	CO5	K3
	b) Define pivoting and reshaping. How do they differ?	5	CO5	K2
(OR)				
10.	Create two Data Frames with overlapping columns. Show how to:	10	CO5	K4
	a) Perform an inner merge on a key column			
	b) Perform a left join on index			
	c) Merge on multiple keys			
<u>UNIT-VI</u>				
11.	Write code to create a single figure with four subplots displaying:	10	CO6	K4
	a) A line plot			
	b) A bar plot			
	c) A histogram			
	d) A scatter plot			
	Explain how plt.subplots() manages layout.			
(OR)				
12.	a) Distinguish between a bar plot and a histogram.	5	CO6	K3
	b) Give an example use-case for a density plot over a histogram.	5	CO6	K2

Time: 3 Hours**Max Marks: 60**

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	<u>UNIT-I</u>	Marks	CO	Blooms Level
1. a)	Draw the fabrication steps of PMOS transistor and explain its operation in detail.	5M	CO1	L2
b)	Compare CMOS and Bipolar technologies.	5M	CO1	L4
	(OR)			
2. a)	Discuss the drain and transfer characteristics of NMOS transistor in enhancement mode.	5M	CO1	L2
b)	Write about CMOS fabrication in a n-well process with a diagram.	5M	CO1	L2
	<u>UNIT-II</u>			
3. a)	Define threshold voltage? Drive the V_t equation for MOS transistor.	5M	CO2	L3
b)	What is latch-up in CMOS circuits? Write its causes.	5M	CO2	L5
	(OR)			
4. a)	Derive the expression for estimation of Pull-Up to Pull-Down ratio of an n-MOS inverter driven by another n-MOS inverter.	5M	CO2	L3
b)	Draw and explain Bi-CMOS inverter.	5M	CO2	L2
	<u>UNIT-III</u>			
5. a)	Explain λ -based Design Rules in VLSI circuit Design.	5M	CO3	L2
b)	Draw the stick diagram for XOR gate	5M	CO3	L5
	(OR)			
6. a)	Draw and explain the layout for CMOS 2-input NAND gate.	5M	CO3	L5
b)	Draw the stick diagram for $Y = [(A+BC)]'$	5M	CO3	L6
	<u>UNIT-IV</u>			
7. a)	Discuss transmission gate logic.	5M	CO4	L2
b)	Discuss Domino CMOS logic.	5M	CO4	L2
	(OR)			
8. a)	Discuss Pseudo NMOS logic with its advantages and disadvantages	5M	CO4	L4
b)	Discuss clocked CMOS logic.	5M	CO4	L2
	<u>UNIT-V</u>			
9. a)	Describe about the methods for driving large capacitive loads.	5M	CO5	L2
b)	Discuss the limitations of scaling.	5M	CO5	L4
	(OR)			
10. a)	Calculate delay for NMOS inverter pair.	5M	CO5	L3
b)	Discuss major scaling models used in VLSI	5M	CO5	L2
	<u>UNIT-VI</u>			
11. a)	Explain about Design Capture tools.	5M	CO6	L2
b)	Why the chip testing is needed? At what levels testing a chip can occur?	5M	CO6	L4
	(OR)			
12. a)	What is the drawback of serial scan? How to overcome this?	5M	CO6	L4
b)	Discuss BIST and Boundary scan in detail	5M	CO6	L2

Time: 3 Hours

Max Marks: 60

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		Marks	CO	Blooms Level
UNIT-I				
1.	a) Compute harmonic mean of dataset [4,5,8][4, 5, 8][4,5,8].	5M	CO1	L2
	b) Draw and interpret a scatterplot for X=[1,2,3,4,5], Y=[2,4,6,8,10]	5M	CO1	L2
(OR)				
2.	a) Perform decimal scaling normalization on [125,300,850].	5M	CO1	L3
	b) What are the advantages of normalization in data preprocessing?	5M	CO1	L2
UNIT-II				
3.	a) Explain different ways of data cleaning and their importance.	5M	CO2	L2
	b) Explain PCA technique for dimensionality reduction with suitable example.	5M	CO2	L3
(OR)				
4.	a) Use Wrapper method with accuracy metric to select best features on dataset: (X1,X2,X3).	5M	CO2	L3
	b) Discuss clustering as a method for handling noisy data.	5M	CO2	L2
UNIT-III				
5.	a) Out of 150 test samples, 120 are correctly classified. Compute accuracy, error rate.	5M	CO3	L3
	b) Describe the concept of Bagging and Boosting Techniques.	5M	CO3	L3
(OR)				
6.	a) Explain about supervised learning. Mention how it differs from Ensemble learning.	5M	CO3	L4
	b) Explain reinforcement learning using a gaming example.	5M	CO3	L3
UNIT-IV				
7.	a) Discuss Decision Tree classification with entropy and information gain.	5M	CO4	L3
	b) Use KNN (k=3) to classify (5,5) given: (4,4,A), (6,6,A), (5,6,B), (7,5,B), (5,4,A).	5M	CO4	L3
(OR)				
8.	a) Explain Naïve Bayes theorem with a real-time problem.	5M	CO4	L3
	b) Compute Simple Linear Regression for X=[1,2,3], Y=[1,2,2].	5M	CO4	L2
UNIT-V				
9.	a) Illustrate Multiple Linear Regression with suitable example.	5M	CO5	L3
	b) Explain Cross Validation with k=10 using a dataset of size 100.	5M	CO5	L3
(OR)				
10.	a) Perform Polynomial Regression of degree 2 for dataset: (1,1), (2,4), (3,9), (4,16).	5M	CO5	L3
	b) Write short notes on Regularization in regression techniques.	5M	CO5	L2
UNIT-VI				
11.	a) Train a perceptron for OR gate. Show weight updates.	5M	CO6	L3
	b) Differentiate between biological neural networks and artificial neural networks.	5M	CO6	L2
(OR)				
12.	a) Explain delta learning rule for Multi-Perceptron networks.	5M	CO6	L3
	b) Apply delta learning rule with input x=2, target=0, weight=0.5, $\eta=0.2$.	5M	CO6	L4

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UNIT-I

Marks

CO

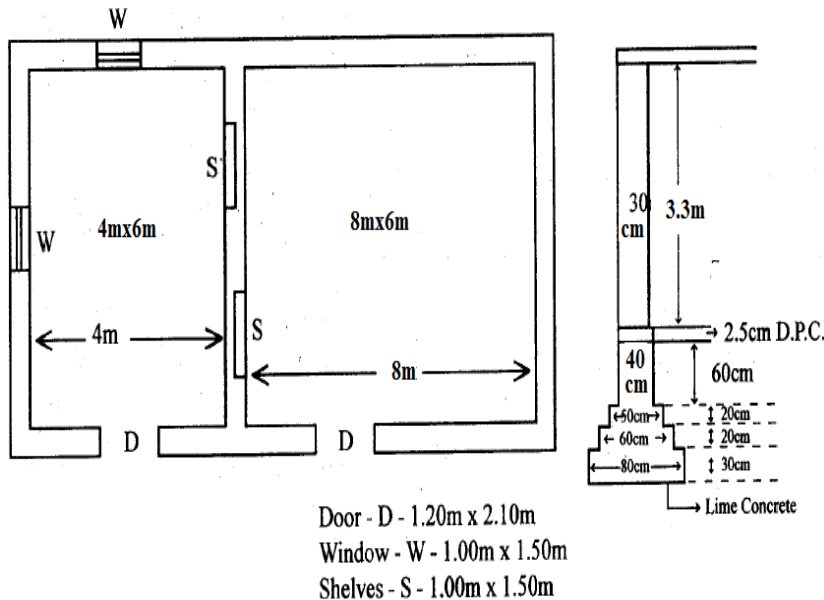
Blooms
Level

1. Calculate below quantities in given fig.
- Earth work
 - Lime concrete in foundation
 - First class brick work in cement mortar in foundation and plinth

10

CO1

4



(OR)

2. Calculate below quantities using the above given figure in question.1
- Calculate quantity of R-R masonry for footing.
 - DPC 2.5cm
 - First class brick work in cement mortar in superstructure
 - Calculate the RCC for lintels.

10

CO1

4

UNIT-II

3. The following width of the road embankment is 8m. The side slopes are 3:1. The depth along the centre line road at 50m intervals is 1.25, 1.10, 1.50, 1.20, 1.0, 1.10, 1.15m. Calculate the Quantity of earth work by Mid sectional rule

10

CO2

3

(OR)

Estimate the quantity of earth work between 0 chainage and 120 m chainage at equal intervals of 20.00 m.

10

CO2

3

Chainage	0	20	40	60	80	100	120
R.L.of Ground	78.10	77.74	77.80	78.20 80.40	80.75	80.20	

UNIT-III

5. What is rate analysis? Prepare rate analysis for the following items 10 CO3 2
- (i) 230mm brick wall in cement mortar 1:3 on ground floor
(ii) cement plaster 12mm thick in cement mortar 1:5
Include labour cost as per local rates

(OR)

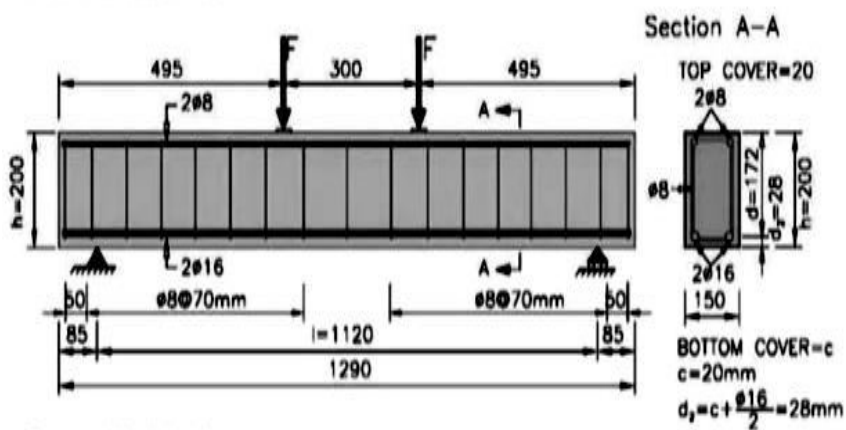
6. Calculate the cost of the R.R.S. masonry for 1 cu.m. the ratio of mortar is 1:6. The cost of boulders for 1 cu.m. is Rs. 1200, labour – 1st class mason – 1.0, 2nd class masdon – 10 no's, man Mazdoor – 12 no's, women Mazdoor – 10 no's. For R.R.S. masonry volume for 10 cu.m. is taken as 12.50 cu.m. 10 CO3 3

UNIT-IV

7. Estimate the quantity of steel required by preparing a bar bending schedule for a column having the following details. The height of the column is 4 m and having a cross-sectional area is 300 x 400 mm and having a 40 mm of clear cover. Six bars are going to use having a diameter of 16 mm. The diameter of the stirrup is 8 mm and having spacing @ 150 mm and @200 mm at L/3 respectively 10 CO4 2

(OR)

8. Prepare a detailed estimate of a R.C.C Beam with 8 mm stirrups @200 mm C/C through out the length as shown in fig. 10 CO4 4



UNIT-V

9. What are the details a contract document must contain, discuss in detail 10 CO5 2

(OR)

10. What is Building Information Modeling and mention the Advantages and Dis advantages of BIM 10 CO5 3

UNIT-VI

11. What is depreciation, and discuss Types of Depreciation of industrial buildings and commercial Buildings 10 CO6 2

(OR)

12. A 30 years commercial building of plinth area 300 sq.m (30x10m) constructed on a site 500sq.m is to be valued. The prevailing land value is Rs.20000/-sqm. Construction cost is Rs. 20000/-sqm. Calculate the value after assuming suitable data if needed. 10 CO6 4

AR18

CODE: 18CST417

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

IV B.Tech I Semester Supplementary Examinations, February 2026

**UML & Design Patterns
(COMPUTER SCIENCE AND ENGINEERING)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered in one place

UNIT-I

1. a) Define UML and explain the importance of modelling with an example 6M
b) Explain in detail about object-oriented modelling 6M
- (OR)**
2. a) Explain in detail about MVC Architecture with a neat sketch 6M
b) Explain the following i)Generalization ii)Association with an example 6M

UNIT-II

3. a) Summarize the concept of the Use Case diagram and draw a neat diagram for Online Movie Ticket Booking and Write about EXTEND Relationship 6M
b) What is UML Interaction Diagram and what is the notation used 6M
- (OR)**
4. a) Outline about Activity Diagram with Notations and symbols 6M
b) Construct a collaboration diagram and list out the notations used 6M

UNIT-III

5. a) Explain in detail the concept of State Machines with a neat sketch 6M
b) Distinguish processes and threads 6M
- (OR)**
6. a) Explain in brief about Component Diagram along with the parameters 6M
b) What is the purpose of the Deployment diagram explain the basic elements of the deployment diagram with a neat sketch 6M

UNIT-IV

7. a) Illustrate about types of Design Patterns 6M
b) Write about the objects in small talk MVC in detail 6M
- (OR)**
8. a) How can we relate Design patterns to UML 6M
b) What are the Static and dynamic elements in Design Patterns 6M

UNIT-V

9. a) What is the Advantage and Usage of Chain of Responsibility Pattern. 6M
b) Difference between Object Adapter Vs Class Adapter 6M
- (OR)**
10. a) What are the specifications for the Adapter pattern and list out the Advantages of the Adapter Pattern 6M
b) Elaborate about Proxy Design Pattern. List out Different types of Proxies with an example 6M