R-20

Code: 20A353T

III B.Tech. I Semester Regular & Supplementary Examinations December 2023

Design of Machine Elements - II
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

1. Answer all the following short answer questions (5 X 2 = 10 Marks)	**CO**	**BL**
a) Illustrate the distribution of shear stresses in the wire of spring.	CO1	4
b) Differentiate full and partial journal bearings.	CO2	2
c) What do you mean by radial load factor?	CO3	2
d) What is Lewis form factor how does it vary with number of teeth on gear?	CO4	1
e) Name the materials for crankshafts.	CO5	1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

	Marks	CO	BL

UNIT-I

| 2. | Design a belt drive to transmit 110 kW for a system consisting of two pulleys of diameters 0.9 m and 1.2 m, centre distance of 3.6 m, a belt speed 20 m / s, coefficient of friction 0.3, a slip of 1.2% at each pulley and 5% friction loss at each shaft, 20% over load. | 12M | CO1 | L4 |

OR

| 3. | Design a helical compression spring for a spring-loaded safety valve for the following data: | | | |

Operating pressure = 1 MPa

Maximum pressure when the valve blows off freely=1.1 MPa

Maximum lift of valve when the pressure is 1.1 MPa = 6 mm

Diameter of valve seat = 100 mm

Maximum shear stress = 360 MPa

Modulus of rigidity = 84 GPa

Spring index = 5.5   12M   CO1   L4

UNIT-II

4. Design a journal bearing for a centrifugal pump from the following data : Load on the journal = 20 000 N; Speed of the journal = 900 r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg / m-s; Ambient temperature of oil = 15.5°C ; Maximum bearing pressure for the pump = 1.5 N / mm². Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m²/°C.   12M   CO2   L6

OR

5. Design the main bearings of a stationary slow speed steam engine to support a load of 30 kN. The engine speed is 200 rpm. Select suitable oil for satisfactory operation. Also determine the minimum film thickness and amount of oil to be supplied. Is artificial cooling required and if so, calculate the amount of heat to be removed.   12M   CO2   L6

UNIT-III

6. A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is 20×10^6 revolutions at 95% reliability, calculate dynamic load rating of the ball bearing.   12M   CO3   L6

OR

7. A transmission shafting is supported on two bearings A and B, 300 mm apart. The bearing 'A' receives a 2000 N and a thrust load of 1000 N while bearing 'B' receives a radial load of 3000 N. The life may be computed based on working condition of 10 hours/day, 5 days/week for 2 years. The shaft rotates at 1000 rpm. The loads have been accurately calculated and only minor shocks are present. The shaft diameter based on strength is 35 mm. Select suitable ball-bearings for shaft at A and B.   12M   CO3   L6

UNIT-IV

8. A pair of spur gears is to be designed as per Lewis beam strength. The pinion rotates at 800 rpm and transmits 6 kW to a gear rotating at 200 rpm. Starting torque of electric motor supplying power to pinion can be taken as 140% of rated torque. For pinion and gear both, allowable bending stress is 150 MPa.

   Take face width, b = 12 m, where m is module.

   Lewis form factor y = [0.154 − (0.912 / z)] where, z is the number of teeth

   Velocity factor, C_v = [3 / (3 + v)]

   Take factor of safety of 2. **12M** CO4 L6

OR

9. A pair of helical gears consists of 24 teeth pinion meshing with 72 teeth gear. Normal pressure angle is 20°, and helix angle is 24°. The pinion rotates at 720rpm. Normal module of gear is 5 mm and face width is 50 mm. Both, pinion and gear are made of steel with σ_{ut} = 600 Mpa. Gears are heat treated to a surface hardness of 360 BHN. What power can be transmitted by gears if service factor is 1.4 and factor of safety is 2? Assume that velocity factor accounts for the dynamic load. **12M** CO4 L6

UNIT-V

10. Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100 mm; Stroke = 125 mm ; Maximum gas pressure = 5 N/mm^2; Indicated mean effective pressure = 0.75 N/mm^2; Mechanical efficiency=80% ; Fuel consumption=0.15kg per brake power per hour ; Higher calorific value of fuel = 42 × 10^3 kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed. **12M** CO5 L6

OR

11. a) Describe how an I-section is designed for a connecting rod. **8M** CO5 L1

    b) Explain, how reversed bending loads on crankshaft cause fatigue failure? **4M** CO5 L4

*** End ***

R-20

Code: 20A55FT

III B.Tech. I Semester Regular & Supplementary Examinations December 2023
Data Structures using Python
(Common to CE &ME)

Max. Marks: 70   Time: 3 Hours
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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
    2. In Part-A, each question carries **Two marks.**
    3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer *all* the following short answer questions (5 X 2 = 10M)			
a) Define Data Structure		1	L1
b) Define stack data structure		2	L1
c) Write recursive function for Fibonacci series		3	L1
d) Define binary tree		4	L1
e) Define tries		5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
	UNIT-I			
2.	Explain Multi dimensional arrays in python	12M	1	L2
	OR			
3.	Explain Python - Amortized Analysis	12M	1	L2
	UNIT-II			
4.	Explain the stack and write a program to implement stack	12M	2	L2
	OR			
5.	Explain implementation of Queue ADT using Python List with examples	12M	2	L2
	UNIT-III			
6.	Explain the concept of binary search and write a program to implement binary search using recursion	12M	3	L2
	OR			
7.	Explain Quick sort? Sort the following elements using merge sort. Below is example for Your reference 45 ,23 ,20 ,50, 70, 24, 33, 43, 47	12M	3	L2
	UNIT-IV			
8.	With a neat diagram explain the structure of Priority Queue with examples and also give its applications	12M	4	L2
	OR			
9.	Define heap. Explain heap sort with example	12M	4	L1
	UNIT-V			
10.	Which pattern matching algorithm scans the characters from right to left? Explain it with suitable example.	12M	5	L2
	OR			
11. a)	What is a binary trie? Construct a binary trie with elements: 0001, 0011, 1000, 1001, 1100, 0010, 1101, 1010.	6M	5	L3
b)	Draw the flowchart for Knuth-Moriris-Pratt algorithm.	6M	5	L3

*** End ***

Code: 20A25FT

R-20

III B.Tech. I Semester Regular & Supplementary Examinations December 2023
Electric Vehicles
(Common to ME and ECE)

Max. Marks: 70

Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer *all* the following short answer questions (5 X 2 = 10M)			
a)	Differentiate between hybrid vehicle and plug in hybrid vehicle.	CO1	L2
b)	What is Propulsion power?	CO2	L1
c)	Define state of charge.	CO3	L1
d)	Write the criteria for selection of EV motors.	CO4	L1
e)	Define converter.	CO5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

			Marks	CO	BL
		UNIT-I			
2.	a)	With help of Block Diagram explain major components of electric vehicle	6M	CO1	L1
	b)	Compare petrol and electric vehicle with their merits and demerits.	6M	CO1	L2
		OR			
3.	a)	Explain about the history of hybrid and electric vehicles.	8M	CO1	L2
	b)	Write short notes of future of EVs.	4M	CO1	L1
		UNIT-II			
4.	a)	Explain the laws of motion of vehicle.	6M	CO2	L2
	b)	Explain the concept of energy consumption of EV.	6M	CO2	L2
		OR			
5.	a)	Which are the resistive forces that retard the motion of a four wheel vehicle? Show with a diagram.	6M	CO2	L2
	b)	Write short notes on i) specific energy ii) specific power	6M	CO2	L1
		UNIT-III			
6.	a)	What are battery parameters? Explain each briefly.	6M	CO3	L1
	b)	Explain Lead- acid battery batteries schematic and physical structure	6M	CO3	L2
		OR			
7.		Explain with a neat sketch the working principle of Li-ion battery used in EV	12M	CO3	L2
		UNIT-IV			
8.		Draw and explain the block diagram of switched reluctance motor drive system.	12M	CO4	L1
		OR			
9.		Explain with a neat block diagram the torque control of BLDC motor	12M	CO4	L2
		UNIT-V			
10.		Explain the working of DC-DC converter with neat diagram	12M	CO3	L1
		OR			
11.		Explain the working of DC-AC converter with neat diagram	12M	CO3	L2

*** End ***

R-20

Code: 20A35AT

III B.Tech. I Semester Regular & Supplementary Examinations December 2023

IC Engines
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

    2. In Part-A, each question carries **Two marks.**

    3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer *all* the following short answer questions (5 X 2 = 10M)			
a)	Mention the function of carburetor venturi. List down the different types of jets used in carburetor.	CO1	L1
b)	What do you understand by the term knocking? How it can be eliminated?	CO2	L2
c)	Write the significance of delay period in a CI engine.	CO3	L2
d)	Describe the methods of finding frictional power in a multi cylinder SI and CI engine.	CO4	L2
e)	Write down the mechanism of NOx formation reactions.	CO5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL

UNIT-I

		Marks	CO	BL
2.	Draw the schematic diagram of a typical Electronic injection system and describe the functions of individual components.	12M	CO1	L2

OR

3.	Illustrate the different types of lubrication systems. Compare wet sump and dry sump lubrication system.	12M	CO1	L3

UNIT-II

4.	Describe the requirements of SI engine fuel. How octane number of an unknown fuel can be measured? Why lead is not recommended to use as an additive to gasoline?	12M	CO2	L2

OR

5.	Explain the effect of various engine variables on SI engine knock. What are the consequences of abnormal combustion?	12M	CO2	L3

UNIT-III

6.	With neat sketches explain the features of DI and IDI combustion chambers of diesel engines.	12M	CO3	L3

OR

7. Explain the various factors that affect the diesel engine combustion. 12M CO3 L3

UNIT-IV

8. During the trial of a four stoke, single cylinder, oil engine the following observations were recorded: bore = 300 mm, stroke = 400 mm, speed = 200 rpm, duration of trial = 60 minutes, fuel consumption = 7.050 kg, calorific value = 14000 kJ/kg, area of indicator diagram = 322 mm^2 , length of indicator diagram = 62 mm, spring index = 1.1 bar/mm, dead load on the brake drum = 140kg, spring balance reading = 5 kg, brake drum diameter=1600mm, total weight of cooling water=495kg, temperature rise of cooling water =38°C, temperature of exhaust gases = 300°C, air consumption = 311 kg; specific heat of exhaust gases = 1.004 kJ/kg K; specific heat of water=4.186 kJ/kg K; room temperature = 20°C.

Determine (i) Brake power   (ii) Indicated power

(iii) Mechanical efficiency (iv) Indicated thermal efficiency 12M CO4 L4

OR

9. A six cylinder, gasoline engine operates on the four stroke cycle. The bore of each cylinder is 80 mm and the stroke is 100 mm. The clearance volume per cylinder is 70 cc. At the speed of 4100 rpm, the fuel consumption is 5.5 gm/sec and the torque developed is 160 Nm. Draw the heat balance sheet of the test engine. Assume calorific value of the fuel=44000kJ/kg. 12M CO4 L4

UNIT-V

10. Describe the mechanism of formation of CO, and UBHC emissions from I.C. engines. 12M CO5 L2

OR

11. Explain the principle of operation of a three way catalytic converter with neat sketch. 12M CO5 L3

*** End ***

R-20

Code: 20A35CT

III B.Tech. I Semester Regular & Supplementary Examinations December 2023

Industrial Management
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)

2. In Part-A, each question carries **Two marks.**

3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer **all** the following short answer questions (5 X 2 = 10M)			
a) Explain the basic concepts related to Organization.		1	L2
b) Define Safety Stock and Reorder Level.		2	L1
c) Explain the Concept of Work Study.		3	L2
d) What do you mean by Critical Activity and Critical Path?		4	L4
e) Define Environmental Scanning.		5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

	Marks	CO	BL

UNIT-I

	Marks	CO	BL
2. Define Management? Explain Henry Fayol's 14 Principles of Management in brief.	12M	1	L1

OR

| 3. a) What is an Organization? Explain its Importance. | 6M | 1 | L3 |
| b) List out Different types of Organization. | 6M | 1 | L4 |

UNIT-II

| 4. What is Plant Layout? Explain different types of Layouts suitable for Batch and Process Production. | 12M | 2 | L4 |

OR

| 5. How the cost of the product can be reduced through Inventory Management? The rate of use of a particular raw material from stores is 20 units per year. The cost of placing and receiving an order is Rs 40/-. The cost of each unit is Rs 100/-. The cost of carrying inventory in percent per year is 0.16 and it depends upon the average stock. Determine the Economic Order Quantity. If the Lead time is 3 months, calculate the reorder point. | 12M | 2 | L5 |

UNIT-III

6. a) What is the Role of Work Study in improving Productivity?   6M   3   L3

   b) State the procedural steps used in performing Method Study?   6M   3   L4

OR

7. Discuss various stages in Product Life Cycle? Why is it essential for the marketer to know about the stages in Product Life Cycle of his /her Product or Service?   12M   3   L4

UNIT-IV

8. A project has nine activities, the expected time of each activity as follows.

S.No	Job	Duration in Days
1	1-2	6
2	1-3	8
3	2-4	7
4	3-4	12
5	4-6	3
6	5-6	5
7	3-5	7
8	5-7	11
9	6-7	10

   a) Draw Project Network Diagram.
   b) Find the Total Duration of the Project.
   c) Identify the Critical Path.
   d) Determine the Slack at each Activity.   12M   4   L5

OR

9. a) Distinguish between PERT and CPM.   8M   4   L2

   b) Explain the Role of Project Crashing in Project Management.   4M   4   L2

UNIT-V

10. State different Wage Incentive Plans. Explain any two with advantages, limitations and applications.   12M   5   L4

OR

11. Explain the concept of Corporate Planning. Discuss the essential steps in Corporate Planning through a Flow Chart.   12M   5   L2

*** End ***

Hall Ticket Number : ☐☐☐☐☐☐☐☐☐☐

Machining Processes

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
      2. In Part-A, each question carries **Two marks.**
      3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer all the following short answer questions   (5 X 2 = 10M)   CO   BL

		CO	BL
a)	Draw the nomenclature of cutting tool geometry or cutting tool signature	1	L2
b)	What is Swiss type lathe?	2	L1
c)	Mention the differences between shaper and planer.	3	L2
d)	Define lapping	4	L1
e)	State the purpose of Jigs and Fixtures	5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

                                                              Marks   CO   BL

UNIT–I

		Marks	CO	BL
1.	Draw a Merchants circle diagram and derive expressions to show relationships among the different forces acting on the cutting tool and different parameters involved in metal cutting.	12M	1	L3

OR

			Marks	CO	BL
2.	a)	Explain ideal properties of cutting tool materials	6M	1	L2
	b)	Discuss about tool life	6M	1	L2

UNIT–II

			Marks	CO	BL
3.	a)	Comparison between capstan and turret lathe	6M	2	L2
	b)	Explain principle features of automatic lathe	6M	2	L2

OR

			Marks	CO	BL
4.	a)	Describe turning process on Lathe.	6M	2	L2
	b)	Sketch and explain single spindle automate lathe	6M	2	L2

UNIT–III

			Marks	CO	BL
5.	a)	Explain the working of radial drilling machine with a neat sketch	6M	3	L2
	b)	Describe various machining applications of slotting machine	6M	3	L2

OR

6 a)	Differentiate between shaper and planer.	6M	3	L2
b)	What is indexing? Explain simple indexing.	6M	3	L2

UNIT–IV

7. a)	Explain Centreless griding with a neat sketch	6M	4	L2
b)	Explain various types of surface finishing processes	6M	4	L2

OR

8.	What is broaching? What are its advantages? What are the principle types of broaching machines?	12M	4	L1

UNIT–V

9.	Describe the designs principles of jigs and fixtures?	12M	5	L2

OR

10.	What is the purpose of clamping? What factors govern the choice of a clamping device to achieve the purpose of clamping? Discuss them in detail	12M	5	L2

*** End ***

Code: 20A351T

R-20

III B.Tech. I Semester Regular & Supplementary Examinations December 2023

Applied Thermodynamics
(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. In Part-A, each question carries **Two marks.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer **all** the following short answer questions	(5 X 2 = 10M)		
a) Name some high-pressure boilers.		CO1	L1
b) What are the differences between convergent and convergent-divergent nozzle.		CO2	L1
c) Define thermal efficiency and degree of reaction of a steam turbine.		CO3	L1
d) Differentiate turbojet from turboprop engine.		CO4	L1
e) Write the properties of common refrigerants.		CO5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL

UNIT–I

	Marks	CO	BL
2. Steam at 20 bar, 360^0 C is expanded in a steam turbine to 0.08 bar. It then enters the condenser where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assuming ideal processes, find the net work done per kg of steam and Rankine cycle efficiency. Draw both the T-S and h-s diagrams of cycle.	12M	CO1	L4

OR

	Marks	CO	BL
3. Explain the working principle and operation of Babcock-Wilcox boiler with a neat schematic diagram.	12M	CO1	L2

UNIT–II

	Marks	CO	BL
4. Dry saturated steam at a pressure of 8 bar absolute enters a C-D nozzle and leaves at 1.5 bar absolute. If the flow is isentropic and corresponding expansion index is 1.135, find the ratio of cross-sectional area at exit and throat for maximum discharge.	12M	CO2	L3

OR

	Marks	CO	BL
5. a) Discuss the effect of friction on the steam quality in flow through a steam nozzle.	6M	CO2	L2

b) Steam expands in a convergent nozzle from 3 bar to 1 bar in a nozzle. The initial velocity is 90 m/s and the initial temperature of steam is 150°C. The nozzle efficiency is 0.95. Determine the exit velocity.   6M CO2 L3

UNIT–III

6. What is compounding of steam turbines? Explain in detail velocity compounding of impulse turbine. What are its advantages?   12M CO3 L2

OR

7. Steam with the velocity of 1000 m/s enters a single stage impulse turbine. The mean diameter of turbine rotor is 25 cm and it rotates with a speed of 15,000 rpm. The steam flow through the turbine is 12 kg/min. Taking the velocity coefficient of blades as 0.85, find the (i) tangential force on the blades, (ii) axial force on the blades, (iii) power developed by the turbine and (iv) blade efficiency.   12M CO3 L4

UNIT–IV

8. Derive expressions for thermal efficiency and work ratio of constant pressure closed cycle gas turbine. Represent the thermodynamic cycle on both p-v and T-S planes.   12M CO4 L2

OR

9. The pressure ratio of an open cycle constant pressure gas turbine plant is 6. The temperature range of the plant is 15^0 C and 800^0 C. Using the following data:
C_{pa} = 1 kJ/kg-K, C_{pg}=1.075 kJ/kg-K,   = 1.4 for air and gases, CV of fuel=43,000 kJ/kg, $_c$ = 0.85, $_t$ = 0.90,   combustion = 0.95, find

a) the thermal efficiency of the plant

b) power developed by the plant if the circulation of air is 5 kg/s

c) air-fuel ratio and   (d) specific fuel combustion.

Draw the T-S diagram representing different processes of cycle.   12M CO4 L4

UNIT–V

10. A Bell-Coleman refrigeration cycle works between 1 bar and 6 bar. Compression follows $pv^{1.25}$ = C and expansion follows $pv^{1.3}$=C. Find COP and capacity of unit in tons of refrigeration if the air flow is 0.5 kg/s. Assume compression and expansion begin at 7°C and 37°C respectively. Neglect clearance. Draw the p-V diagram representing cycle of operation.   12M CO5 L3

OR

11. Explain different psychrometric processes representing them on psychrometric chart.   12M CO5 L2

*** End ***

Code: 20A15FT

III B.Tech. I Semester Regular & Supplementary Examinations December 2023

Disaster Management
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
      2. In Part-A, each question carries **Two mark.**
      3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A
(Compulsory question)

		CO	BL
1. Answer *all* the following short answer questions (5 X 2 = 10M)			
a)	Describe in brief about landslides?	CO1	L2
b)	List the activities that trigger human-induced disasters.	CO2	L1
c)	Explain Disaster management cycle?	CO3	L2
d)	List out the public emergency services available in the state, which could be approached for help during a natural disaster.	CO4	L1
e)	Describe the various components of post flood rehabilitation measures?	CO5	L1

PART-B
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	BL
UNIT–I				
2.	Explain the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?	12M	CO1	L2
OR				
3.	Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.	12M	CO1	L2
UNIT–II				
4.	Describe major chemical industrial hazards in India	12M	CO2	L1
OR				
5.	Explain type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?	12M	CO2	L2
UNIT–III				
6.	Explain in detail about Methods of crisis management.	12M	CO3	L2
OR				
7.	Explain the role and functions of a disaster manager.	12M	CO3	L2
UNIT–IV				
8.	Describe structural and non-structural mitigation measures in disaster management.	12M	CO3	L1
OR				
9.	Discus the different aspects of disaster mitigation through advanced technology.	12M	CO4	L2
UNIT–V				
10.	Discuss why there is a need for capacity building? Categorize its vital components.	12M	CO5	L2
OR				
11.	Discuss the important guiding principles of rehabilitation and reconstruction.	12M	CO5	L2

*** End ***