SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
Accredited by NAAC with 'A+' Grade
Recognised as Scientific and Industrial Research Organisation
SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	

CIVIL ENGINEERING (Honors)

COURSE STRUCTURE
(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	C.I.E	S.E.E	Total Marks
B23CEH101	Structural Dynamics	III-I	3	3	0	0	30	70	100
B23CEH201	Matrix Methods of Structures	III-II	3	3	0	0	30	70	100
B23CEH301	Earthquake Engineering	IV-I	3	3	0	0	30	70	100
B23CEH401	*MOOCS-I	III-I to IV-I	3	--	--	--	--	--	100
B23CEH501	*MOOCS-II	III-I to IV-I	3	--	--	--	--	--	100
B23CEH601	*MOOCS-III	III-I to IV-I	3	--	--	--	--	--	100
		TOTAL	**18**	**9**	**0**	**0**	**90**	**210**	**600**

*Three MOOCS courses of any CIVIL ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of 12 weeks (3 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between III Year I Semester to IV Year I Semester

Code	Category	L	T	P	C	I.M	E.M	Exam
B23CEH101	**Honors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

STRUCTURAL DYNAMICS

(Honors Degree course in CE)

Course Objectives:

1.	Introduces to the Concept of vibration of SDOF System
2.	Introduces to Damped and Undamped systems
3.	Introduces to Free and forced Vibration systems
4.	Introduces to Free and Forced vibration Of MDOF System

Course Outcomes: At the end of the course, Student will be able to

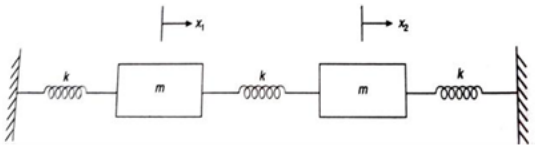
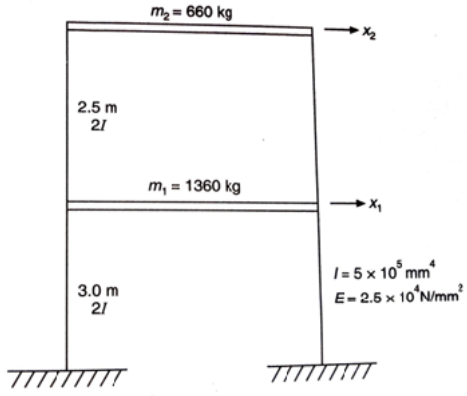
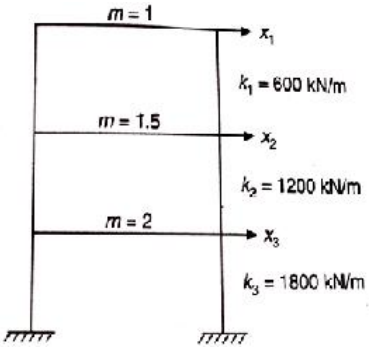
S.No	Outcome	Knowledge Level
1.	**Understand** and Analyze the Concepts of vibrations	K4
2.	**Understand** and Analyze the concepts of Undamped Free vibration of SDOF	K4
3.	**Understand** and Analyze the concepts of damped Free vibration of SDOF	K4
4.	**Understand** and Analyze the concepts of Two Degree of Freedom System	K4
5.	**Understand** and Analyze the concepts of Multiple Degree of Freedom System	K4

SYLLABUS

UNIT-I (8 Hrs)	**Elements of vibrations:** Introduction – Basic Concepts of vibration –Dynamic Loading-Comparison of Static Loading and Dynamic Loading – Causes of Dynamic Effects – Basic Definitions- Types Of Vibrations- Response OF the System- Degrees Of Freedom-Simple Harmonic Motion- Consequences of Vibration-Vibration controls in the Design ofStructure
UNIT-II (10 Hrs)	**Undamped Free Vibration of SDOF System:** Introduction- Vibration Analysis – Free Vibration of Undamped SDOF system –Derivation of equation of Motion- Solution of the equation of Motion – equivalent Stiffness of Spring Combinations- Natural Frequency and Time Period – Influence of Gravitational force
UNIT-III (10 Hrs)	**Damped Free Vibration of SDOF System:** Introduction- Types of Damping- Viscous Damping- Coulomb damping- Structural Damping-Active Damping or Negative Damping- passive Damping- Measurement of Damping- Logarithmic Decrement method-Half Power Bandwidth Method
UNIT-IV (10 Hrs)	**Two Degrees of Freedom system:** Introduction – Concept of shear building- Free Vibrations of Undamped System-Damped Free Vibration- Forced Vibration Of Undamped System- Forced Vibration Of Damped System

UNIT-V (10 Hrs)	**Multiple Degrees of Freedom Systems: Introduction –** Free Vibration Analysis- Undamped system- Natural Frequencies and Normal Modes- Orthogonality and Normality Principles- Damped Systems- Decoupling of Equations/concept of modal Superposition Method.
Text Books:	
1.	Structural Dynamics Anil K Chopra, 4edition, Prentice HallPublishers
2.	Structural Dynamics Theory & Computation – Mario Paz, CBS Publishes and Distributors
Reference Books:	
1.	Structural Dynamics and Aseismic design – S.R.Damodarasamy and S.Kavitha, PHI Learning private limited
2.	Dynamics of Structures by Clough &Penzien 3e, Computers & Structures Inc.
3.	Structural Dynamics of Earthquake Engineering - Theory and Application using Mathematical and Mat lab- S.Rajasekharan

					Course Code: B23CEH101
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		STRUCTURAL DYNAMICS			
		(Honors Degree Course in CE)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	Discuss the basic concepts involved in structural vibrations.	1	2	2
	b).	Describe the consequences of vibrations in structures.	1	2	2
	c).	Explain the influence of gravitational force on free vibration.	2	2	2
	d).	State and explain the assumptions made in undamped free vibration analysis.	2	2	2
	e).	Describe the characteristics of viscous damping.	3	2	2
	f).	Differentiate between passive and active damping.	3	2	2
	g).	Explain the concept of a shear building in vibration analysis.	4	2	2
	h).	Describe the effects of damping on forced vibration response.	4	2	2
	i).	Explain the term "mode shapes" in MDOF systems.	5	2	2
	j).	Describe the significance of decoupling equations in vibration analysis.	5	2	2
					5 x 10 = 50 Marks
		UNIT-1	**CO**	**KL**	**M**
2.	**a).**	Compare Static Loading and Dynamic Loading?	1	2	5
	b).	A Harmonic motion has a Maximum Velocity of 6 m/s and it has a frequency of 12 cps. Determine its amplitude, its period and its Maximum acceleration.	1	3	5
		OR			
3.	**a).**	Define i) Natural Frequency ii) Amplitude ii) Degree of Freedom	1	2	5
	b).	Explain Vibration and Types of Vibration?	1	2	5
		UNIT-2			
4.	**a).**	Derive expression for response of SDOF system subjected to Undamped free vibration	2	3	10
		OR			
5.	**a).**	Derive the equation of motion of a vibratory system using Simple Harmonic Motion	2	3	10
		UNIT-3			
6.	**a).**	Explain Logarithmic Decrement Method for Measuring damping of a vibration System?	3	2	5

	b).	Explain Damping and Various Types of Damping?	3	2	5
		OR			
7.	**a).**	Derive expression for response of SDOF system subjected to damped free vibration	3	3	10
		UNIT-4			
8.	**a).**	Determine the Natural Frequencies and mode Shape of the given system. 	4	3	10
		OR			
9.	**a).**	Determine the natural Frequencies and mode shape for the structure as shown in below figure. 	4	3	10
		UNIT-5			
10.	**a).**	Derive the equation of motion of Multi Degree freedom systems (MDOF)	5	4	10
		OR			
11.	**a).**	Determine the Natural Frequencies and the mode Shapes for the Shear building as shown in below figure. 	5	4	10

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B23CEH201	**Honors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

MATRIX METHODS OF STRUCTURES

(Honors Degree course in CE)

Course Objectives:

1.	To prepare the students to have a basic knowledge in the matrix methods such as flexible matrix method and Stiffness matrix method.
2.	To prepare the students to analyze the beams and portal frame problems by matrix methods.

Course Outcomes: At the end of the course, Student will be able to

S.No	Outcome	Knowledge Level
1.	**Understand** the basic concepts involved in the analysis of structural elements using matrix methods.	K2
2.	**Analyze** the beams by using flexibility matrix method.	K4
3.	**Analyze** the portal frames by using flexibility matrix method.	K4
4.	**Analyze** the beams by using Stiffness matrix method.	K4
5.	**Analyze** the portal frames by using Stiffness matrix method.	K4

SYLLABUS

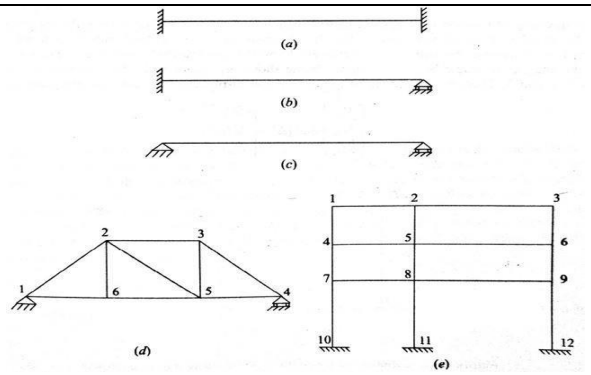
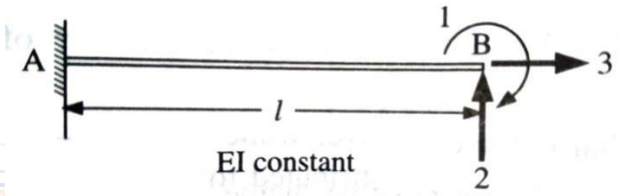
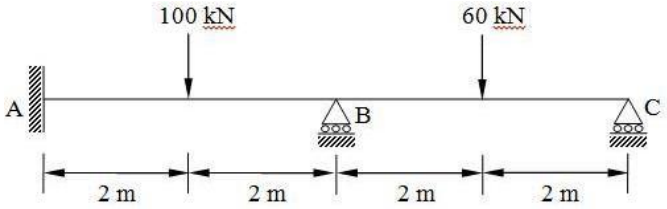
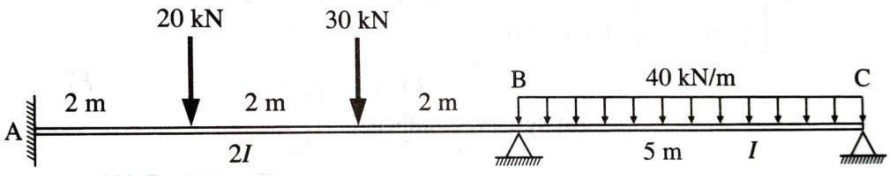
UNIT-I (8 Hrs)	**Introduction**: Matrix methods of analysis–Static and kinematic indeterminacy–Degree of static and kinematic indeterminacy –Structure idealization – flexibility and stiffness methods.
UNIT-II (10 Hrs)	**Flexibility Matrix Method (Beams)**: Analysis of continuous beams without sinking of supports (up to maximum degree of three)
UNIT-III (10 Hrs)	**Flexibility Matrix Method (Portal Frames)**: Analysis of portal frames without sway condition (up to maximum degree of three).
UNIT-IV (10 Hrs)	**Stiffness Matrix Method (Beams)**: Analysis of continuous beams without sinking of supports (up to maximum degree of three)
UNIT-V (10 Hrs)	**Stiffness Matrix Method (Portal Frames)**: Analysis of portal frames without sway condition (up to maximum degree of three).

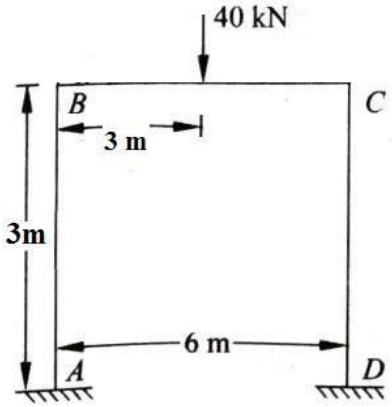
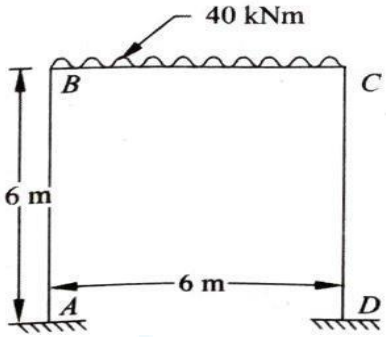
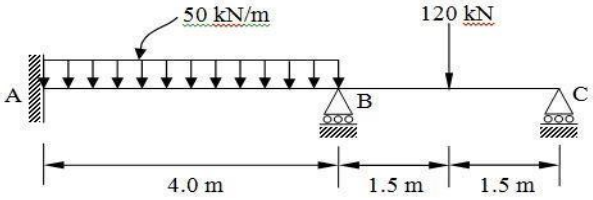
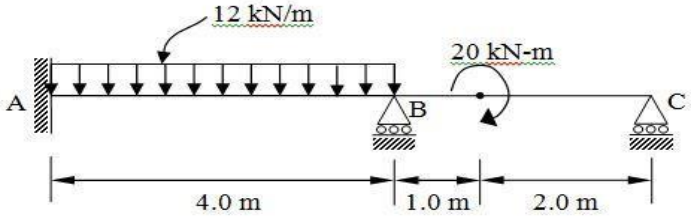
Text Books:

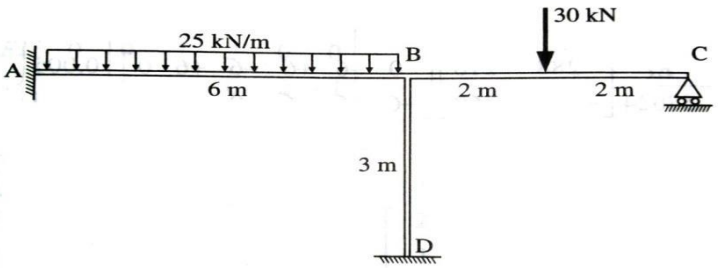
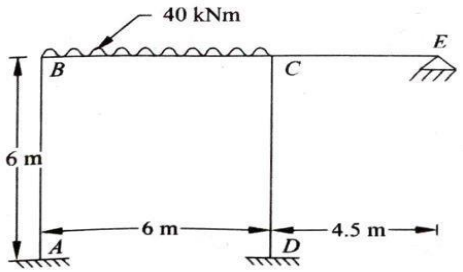
1.	Matrix analysis of structures,Robert E Sennet-Prentice Hall-Englewood cliffs-New Jercy
2.	Advanced structural analysis, P. Dayaratnam -Tata McGrawhill publishing company limited.
3.	Structural Analysis Matrix Approach –Pandit and Gupta ,McGraw Hil Education

Reference Books:	
1.	Indeterminate Structural analysis, C K Wang, Amazon Publications.
2.	Matrix Analysis of Frame dVan Nostrand Reinhold, New york Structures 3e-William We aver,Jr,James M.Gere,
3.	Foundation Analysis and design,J.E.Bowls,5e, Amazon Publications.

					Course Code: B23CEH201
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		MATRIX METHOD OF STRUCTURES			
		(Honors Degree Course in CE)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	Define static and kinematic indeterminacy of a structure.	1	2	2
	b).	Differentiate between flexibility and stiffness methods.	1	2	2
	c).	Explain the procedure to form a flexibility matrix for a two-span continuous beam.	2	2	2
	d).	Compute the degree of static indeterminacy for a continuous beam with three supports.	2	2	2
	e).	List the steps in analyzing a portal frame using the flexibility method under non-sway conditions.	3	2	2
	f).	Determine the static indeterminacy of a fixed-base portal frame and identify the redundants.	3	2	2
	g).	State the advantages of the stiffness method over the flexibility method in beam analysis.	4	2	2
	h).	List the basic assumptions made in the stiffness matrix method for beam analysis.	4	2	2
	i).	Explain the assembly procedure of the global stiffness matrix for a portal frame.	5	2	2
	j).	Solve for member end moments of a simple portal frame using the stiffness method.	5	2	2
					5 x 10 = 50 Marks
		UNIT-1	**CO**	**KL**	**M**
2.	**a).**	Explain degree of static indeterminacy and kinematic Indeterminacy of a structure.	1	2	4
	b).	Calculate degree of Static and Kinematic indeterminacy of the following structures (**Fig. 1**)	1	3	6

		 **Fig. 1**			
		OR			
3.	**a).**	Explain relation between flexibility matrix method and stiffness matrix method.	1	2	4
	b).	Develop stiffness matrix for the beam shown in **Fig. 2** with reference to the co-ordinates shown.  **Fig. 2**	1	3	6
		UNIT-2			
4.	**a).**	Solve the continuous beam as shown in the **Fig.3** by using flexibility matrix method. Take EI is constant throughout the structure. Draw bending moment and diagrams  **Fig. 3**	2	3	10
		OR			
5.	**a).**	Solve the continuous beam shown in **Fig. 4** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 4**	2	3	10
		UNIT-3			

6.	**a).**	Solve the portal frame shown in **Fig. 5** by using flexibility matrix method. And draw bending moment diagram.  **Fig. 5**	3	3	14
		OR			
7.	**a).**	Solve the portal frame shown in **Fig. 6** by using flexibility matrix method. And draw bending moment diagram.  **Fig. 6**	3	3	10
		UNIT-4			
8.	**a).**	Solve the continuous beam as shown in the **Fig. 7** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 7**	4	3	14
		OR			
9.	**a).**	Solve the continuous beam as shown in the **Fig. 8**by using stiffness matrix method.And draw bending moment diagram.  **Fig. 8**	4	3	10

		UNIT-5			
10.	**a).**	Solve the portal frame shown in **Fig. 9** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 9**	5	3	10
		OR			
11.	**a).**	Solve the portal frame shown in **Fig. 10** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 10**	5	3	10

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B23CEH301	**Honors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

EARTHQUAKE ENGINEERING

(Honors Degree course in CE)

Course Objectives:

1.	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of Ground motion and propagation of ground motion.
2.	Learn the fundamentals of building code based structural design

Course Outcomes: At the end of the course, Student will be able to

S. No	Outcome	Knowledge Level
1.	**Understand** Elements of Seismology and classify Earthquakes and Seismic Zoning Map of India	K2
2.	**Understand** Earthquake Response Spectrum	K2
3.	**Determine** the liquefaction of Soils and able to understand concept of Aseismic Design of RC Structures	K3
4.	**Analyze** and Design of RC Building As per IS1893 (PART 1):2002	K4
5.	**Design** Ductile Detailing of RC Structures Subjected to Seismic Forces As per IS 3920:1993	K4

SYLLABUS

UNIT-I (10 Hrs)	Engineering Seismology: Introduction - Reid's elastic Rebound Theory- Theory of Plate tectonics- Seismic waves- Earthquake Size- Local Effects- Internal structure of The earth- Seismotectonics of India- Seismicity of India- Classification of Earthquake- Tsunami-Seismic Zoning Map of India.
UNIT-I (10 Hrs)	Response Spectrum- Introduction- Response Spectrum of Sinusoidal pulse-Water Tank Subjected to base Acceleration-Earthquake Response Spectra-Design Spectra-Concepts of PGA-Site –Site Specific Response Spectra-Response Spectrum IS 1893:2002
UNIT-III (10 Hrs)	Liquefaction of Soils: Introduction-Types of Liquefaction-Effects of Liquefaction-Methods to Reduce Liquefaction-Factors Controlling Liquefaction - Concept of Aseismic Design of RC Structures – Introduction- Design Methodology-Architectural Consideration- Geotechnical Consideration – Structural Design Consideration – Capacity Design- Techniques of Aseismic Design

UNIT-IV (10 Hrs)	Seismic Analysis of RC Building As per IS1893 (PART 1):2002: Introduction- General Principles- load combinations and Increase in Permissible Stresses –
	Design Spectrum- Buildings-Dynamic Analysis- Torsion- Step by Step Procedure For Seismic Analysis of RC Buildings
UNIT-V (8 Hrs)	Ductile Detailing of RC Structures Subjected to Seismic Forces As per IS 3920:1993: Introduction- Design of Flexural Members- Longitudinal Reinforcement- Web Reinforcement- Design of Columns and Frame Members Subjected to Bending and Axial load- Design of joints of Frames

Text Books:	
1.	Earthquake Resistant Design of Structures Pankaj Agarwal and Manish ShriKhande, Prentice -Hall of India, 2007, New Delhi.
2.	Structural Dynamics and Aseismic design – S.R.Damodarasamy and S.Kavitha, PHI Learning private limited
Reference Books:	
1.	Earthquake Resistant Design of Structures- S.K. Duggal, Oxford Publications
2.	Seismic design of reinforced concrete and masonry buildings by Paulay and Priestley
3.	Earthquake Resistant Design and Risk Reduction- David Dowrick

				Course Code: B23CEH301	
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		IV B.Tech. I Semester MODEL QUESTION PAPER			
		EARTHQUAKE ENGINEERING			
		(Honors Degree Course in CE)			
Time: 3 Hrs.				**Max. Marks: 70 M**	
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
				10 x 2 = 20 Marks	
			CO	**KL**	**M**
1.	**a).**	Give the classification of earthquakes based on magnitude.	1	1	2
	b).	Define Tsunami.	1	1	2
	c).	Define response spectrum.	2	1	2
	d).	What is site specific response spectra?	2	1	2
	e).	Define pounding.	3	1	2
	f).	Differentiate between local and global ductility.	3	2	2
	g).	List the type of irregularities in buildings.	4	1	2
	h).	What are the load combinations accounted in limit state design?	4	1	2
	i).	Write the codal provision regarding lap splice in longitudinal reinforcement in columns.	5	1	2
	j).	Mention the any two requirements of web reinforcement in flexural members.	5	1	2
				5 x 10 = 50 Marks	
		UNIT-1			
2.	**a).**	What is plate tectonic theory of origin of earthquakes and explain associated type of movement at the plate boundaries.	1	2	10
		OR			
3.	**a).**	Explain the characteristics of different types of seismic waves.	1	2	6
	b).	Explain the concept of elastic rebound theory with a neat sketch.	1	2	4
		UNIT-2			
4.	**a).**	Explain Response Spectrum of Sinusoidal Pulse?	2	2	10
		OR			
5.	**a).**	Explain the Response Spectrum of Water Tank Subjected to Base Acceleration?	2	2	10
		UNIT-3			
6.	**a).**	Explain Types of Liquefactions and Effects of Liquefaction of Soils.	3	2	5
	b).	Explain Methods to Reduce Liquefaction.	3	2	5

		OR			
7.	**a).**	Explain Design Methodology according to Architectural, Geotechnical and Structural Design Considerations	3	2	10
		UNIT-4			
8.	**a).**	Explain general Aseismic Design Principles	4	2	10
		OR			
9.	**a).**	Determine the design horizontal Seismic Coefficient for an ordinary reinforced concrete moment resisting Frame hospital building without infill panels for a damping of 5 %. The building is Situated in Salem. Height of the Building is 22m and it is resting on Hard Soil.	4	3	10
		UNIT-5			
10.	**a).**	Explain Ductile Design of Flexural Members?	5	2	10
		OR			
11.	**a).**	Explain Ductile Design of Columns and Frames Subjected to Bending and Axial Load?	5	2	10

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 10 marks