Ref No:

# Sri Krishna Institute of Technology, Bangalore

# COURSE PLAN

## Academic Year 2019-2020

| | |
|---|---|
| Program: | B E – Civil Engineering |
| Semester : | 4 |
| Course Code: | 18CV42 |
| Course Title: | Analysis of Determinate Structures |
| Credit / L-T-P: | 4 / 3:2:0 |
| Total Contact Hours: | 50 |
| Course Plan Author: | MOHAN K T |

Academic Evaluation and Monitoring Cell

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# A. COURSE INFORMATION

## 1. Course Overview

| | | | |
|---|---|---|---|
| Degree: | Civil Engineering | Program: | B.E |
| Semester: | 2019/IV | Academic Year: | 2019-20 |
| Course Title: | Analysis of Determinate Structures | Course Code: | 18cv42 |
| Credit / L-T-P: | 3:2:0 | SEE Duration: | 180 Minutes |
| Total Contact Hours: | 50 | SEE Marks: | 60 Marks |
| CIA Marks: | 40 Marks | Assignment | 1 / Module |
| Course Plan Author: | Mohan K T | Sign .. | Dt: |
| Checked By: | | Sign .. | Dt: |
| CO Targets | CIA Target : 73% | SEE Target: | 54% |

**Note:** Define CIA and SEE % targets based on previous performance.

## 2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute.

| Module | Content | Teaching Hours | Blooms Learning Levels |
|---|---|---|---|
| 1 | **Introduction and Analysis of Plane Trusses:** Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non linear analysis, Static and kinematic indeterminacy of structural systems. **Influence Lines:** Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses and numerical problems. | 10 | L2, L4 |
| 2 | **Moving Loads:** Reactions, BM and SF in determinate beams, axial forces in determinate trusses for rolling loads using ILD (Max. values and absolute max. values for beams subjected to multiple loads). | 10 | L4 |
| 3 | **Deflection of Beams:** Moment area method: Derivation, Mohr's theorems, Sign conventions, Application of moment area method for determinate prismatic beams, Beams of varying section, Use of moment diagram by parts. Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections | 10 | L4 |
| 4 | **Energy Principles and Energy Theorems:** Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, Strain energy due to axial force, bending, shear and torsion, Deflection of determinate beams and trusses using total strain energy, Deflection at the point of application of single load, Castig liano's theorems and its application to estimate the deflections of trusses, bent frames, Special applications-Dummy unit load method. | 10 | L4 |
| 5 | **Arches and Cable Structures:** Three hinged parabolic and circular arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels-Stiffening trusses for suspension cables. | 10 | L4 |
| - | **Total** | **50** | |

## 3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes

2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

| Modules | Details | Chapters in book | Availability |
|---|---|---|---|
| **A** | **Text books (Title, Authors, Edition, Publisher, Year.)** | **-** | **-** |
| 1, 2, 3, 4, 5 | 1.Reddy C S, Basic Structural Analysis, Tata McGraw Hill, New Delhi. | 1, 2, 3, 4 | In Lib |
| 1, 2, 3, 4, 5 | 2. Muthu K U. etal, Basic Structural Analysis, 2nd edition, IK International Pvt. Ltd., New Delhi,2015. | 1,2, 3, 4 | In Lib |
| 1, 2, 3, 4, 5 | 3. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New Delhi, 2002. | 1, 2, 3, 4 | In Lib |
| | | | |
| **C** | **Concept Videos or Simulation for Understanding** | **-** | **-** |
| | **Module-1** | | |
| 1 | https://www.youtube.com/watch?v=A9YVQM0gUug | | |
| 2 | https://www.youtube.com/watch?v=eVEN8etXkYc | | |
| 3 | https://www.youtube.com/watch?v=LZ0VrktwtUM&t=114s | | |
| 4 | https://www.youtube.com/watch?v=aNi_Zn_gQrA&list=PLjrNUPGdy6hZT90BK7_6S--tK_lUE9Xtw&index=1 | | |
| 5 | https://www.youtube.com/watch?v=0j8hIdXukkE&list=PLjrNUPGdy6hZT90BK7_6S--tK_lUE9Xtw&index=2 | | |
| | **Module-2** | | |
| 1 | https://www.youtube.com/watch?v=AxThUt8M_ho | | |
| 2 | https://www.youtube.com/watch?v=QGbUFqJdWuc | | |
| 3 | https://www.youtube.com/watch?v=Vg5LDGMoCO4&t=2s | | |
| | **Module-3** | | |
| 1 | https://www.youtube.com/watch?v=1ES78kUkf5o | | |
| 2 | https://www.youtube.com/watch?v=kVJRHaoZfvI | | |
| 3 | https://www.youtube.com/watch?v=whBaUyNmXeA | | |
| 4 | https://www.youtube.com/watch?v=n1-skzqf1qs | | |
| 5 | https://www.youtube.com/watch?v=Q1bypcTs3fY | | |
| 6 | https://www.youtube.com/watch?v=57UiP6tqbqo | | |
| 7 | https://www.youtube.com/watch?v=MR1DmMnLTvw | | |
| 8 | https://www.youtube.com/watch?v=02pOdMKCoVs | | |
| 9 | https://www.youtube.com/watch?v=OSU0ZnJyqtg | | |
| 10 | https://www.youtube.com/watch?v=whZ2y-qXzkI | | |
| | **Module-4** | | |
| 1 | https://www.youtube.com/watch?v=Wx_NNuVR9zI | | |
| 2 | https://www.youtube.com/watch?v=3weEkxXebeo | | |
| 3 | https://www.youtube.com/watch?v=WB__FR_l_LU | | |
| 4 | https://www.youtube.com/watch?v=pjevR7kAX0M | | |
| 5 | https://www.youtube.com/watch?v=WzULLcCJtqU | | |
| 6 | https://www.youtube.com/watch?v=GOEEm4KK1o8 | | |
| 7 | https://www.youtube.com/watch?v=wq-maHO-3Ys | | |
| 8 | https://www.youtube.com/watch?v=a_MvHFuLDdE | | |
| 9 | https://www.youtube.com/watch?v=pAhp20WsNNc | | |
| 10 | https://www.youtube.com/watch?v=TF9lngl48kA | | |
| 11 | https://www.youtube.com/watch?v=NtNii_pmp_8 | | |

| | | | |
|---|---|---|---|
| | **Module-5** | | |
| 1 | https://www.youtube.com/watch?v=d2lka5GD10E | | |
| 2 | https://www.youtube.com/watch?v=pJKfOvN36J0 | | |
| 3 | https://www.youtube.com/watch?v=SuUioxoqgDk&t=283s | | |
| 4 | https://www.youtube.com/watch?v=Ijdr2c6Pig4 | | |
| 5 | https://www.youtube.com/watch?v=GgVsO8RWbJo | | |
| 6 | https://www.youtube.com/watch?v=AiBW49BLu24 | | |
| 7 | https://www.youtube.com/watch?v=pEpnEfwaXrk | | |
| 8 | https://www.youtube.com/watch?v=mQBdG4RkcIc | | |
| | | | |
| | | | |
| **D** | **Software Tools for Design** | **-** | **-** |
| | Staad Pro., ETABS. | | |
| **E** | **Recent Developments for Research** | **-** | **-** |
| | | | |
| | | | |
| | | | |
| **F** | **Others (Web, Video, Simulation, Notes etc.)** | **-** | **-** |
| 1 | | | |
| | | | |

## 4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.
Students must have learnt the following Courses / Topics with described Content . . .

| Modules | Course Code | Course Name | Topic / Description | Sem | Remarks | Blooms Level |
|---|---|---|---|---|---|---|
| 1,3 | 17cv32 | Strength of Materials | 1. Conditions of Equillibrium. 2.Shear force and bending moment diagrams. | 3 | | L3 |
| | | | | | | |

## 5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.
Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

| Modules | Topic / Description | Area | Remarks | Blooms Level |
|---|---|---|---|---|
| 3 | Knowledge on analyzing determinate structures | Higher Study | | Understand L2 |
| | | | | |
| | | | | |
| | | | | |

# B. OBE PARAMETERS

## 1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs.

| Modules | Course Code.# | Course Outcome **At the end of the course, student should be able to . . .** | Teach. Hours | Instr Method | Assessment Method | Blooms' Level |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 18CV42 | Understand different forms of structural systems and Analyse the structure for DOF and drawing ILD Diagram. | 10 | Lecture | CIA and Assignment | L4 |
| 2 | 18CV42 | Understand concept of moving loads and Analyse for the same. | 10 | Lecture | CIA and Assignment | L4 |
| 3 | 18CV42 | Analyse slopes and deflections of beams and trusses. | 10 | Lecture | CIA and Assignment | L4 |
| 4 | 18CV42 | Understand concept of Energy Principles , Energy Theorems and find out Deflection in beams . | 10 | Lecture | CIA and Assignment | L4 |
| 5 | 18CV42 | Analyse arches and cables. | 10 | Lecture | CIA and Assignment | L4 |
| **-** | **-** | **Total** | **50** | **-** | **-** | **L2-L4** |

## 2. Course Applications

Write 1 or 2 applications per CO.
Students should be able to employ / apply the course learnings to . . .

| Modules | Application Area<br>Compiled from Module Applications. | CO | Level |
|---|---|---|---|
| 1 | Used to Determine the structure for its determinacy, and to study the behaviour of structure for its unit loads through ILD. | 1 | L4 |
| 2 | Used to Determine the reactions, shear force and Bending moment for the moving loads for different load conditions. | 2 | L4 |
| 3 | Used to determine the slope and Deflection of the beams by using different methods. | 3 | L4 |
| 4 | Used to determine the Energy principals and Energy theorems for the given structures. | 4 | L4 |
| 5 | Used to determine the reactions, Bending moment and Shear force for arches and Cables. | 5 | L4 |

## 3. Articulation Matrix

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

| - | - | Course Outcomes | Program Outcomes | | | | | | | | | | | | | | - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Modules | CO.# | **At the end of the course student should be able to . . .** | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 | Level |
| 1 | CO1 | Understand different forms of structural systems and Analyse the structure for DOF and drawing ILD Diagram. | 3 | 2 | - | - | - | 2 | 1 | 1 | 3 | 3 | 2 | 2 | | | | L4 |
| 2 | CO2 | Understand concept of moving loads and Analyse for the same. | 3 | 2 | - | - | - | 2 | 1 | 1 | 3 | 3 | 3 | 3 | | | | L4 |
| 3 | CO3 | Analyse slopes and deflections of beams and trusses. | 2 | 3 | - | - | - | 2 | 1 | 1 | 3 | 3 | 3 | 3 | | | | L4 |
| 4 | CO4 | Understand concept of Energy Principles , Energy Theorems and find out Deflection in beams . | 2 | 2 | - | - | - | 2 | 1 | 1 | 3 | 3 | 2 | 3 | | | | L4 |
| 5 | CO5 | Analyse arches and cables. | 2 | 3 | - | - | - | 2 | 1 | 1 | 3 | 3 | 3 | 3 | | | | L4 |

| - | **15EE662.** | Average | | | | | | | | | | | | | | | | - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | *PO, PSO* | *1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Software Engineering; S2.Data Base Management; S3.Web Design* | | | | | | | | | | | | | | | | |

## 4. Curricular Gap and Content

Topics & contents not covered (from A.4), but essential for the course to address POs and PSOs.

| Modules | Gap Topic | Actions Planned | Schedule Planned | Resources Person | PO Mapping |
|---|---|---|---|---|---|
| 1 | | Seminar | 2nd week / date | Dr XYZ, Inst | List from B4 above |
| 2 | | Seminar | 3rd Week | | |

# C. COURSE ASSESSMENT

## 1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

| Modules | Title | Teach. Hours | No. of question in Exam | | | | | | CO | Levels |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | CIA-1 | CIA-2 | CIA-3 | Asg | Extra Asg | SEE | | |
| 1 | Introduction and Analysis of Plane Trusses | 10 | 4 | - | - | 1 | 1 | 2 | CO1 | L2,L4 |
| 2 | Deflection of beams | 10 | 4 | - | - | 1 | 1 | 2 | CO2 | L2,L4 |
| 3 | Energy Principles and Energy Theorems | 10 | - | 4 | - | 1 | 1 | 2 | CO3 | L2,L4. |
| 4 | Arches and cable structures | 10 | - | 4 | - | 1 | 1 | 2 | CO4 | L2,L4 |
| 5 | Influence Lines and Moving Loads | 10 | - | - | 8 | 1 | 1 | 2 | CO5 | L2,L4 |
| **-** | **Total** | **50** | **4** | **4** | **4** | **5** | **5** | **10** | **-** | **-** |

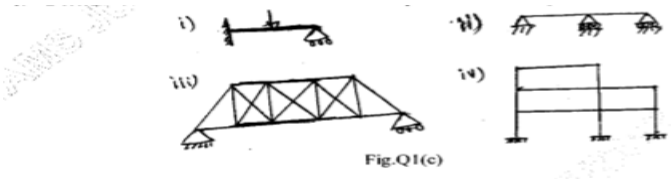
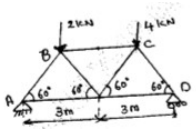
## 2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

| Modules | Evaluation | Weightage in Marks | CO | Levels |
|---|---|---|---|---|
| 1, 2 | CIA Exam – 1 | 30 | CO1, CO2 | L2, L4 |
| 3, 4 | CIA Exam – 2 | 30 | CO3, CO4 | L2, L4 |
| 5 | CIA Exam – 3 | 30 | CO5 | L2, L4 |
| | | | | |
| 1, 2 | Assignment - 1 | 10 | CO6, CO7 | L2, L4 |
| 3, 4 | Assignment - 2 | 10 | CO8, CO9 | L2, L4 |
| 5 | Assignment - 3 | 10 | CO10 | L2, L4 |
| | | | | |
| 1, 2 | Seminar - 1 | | - | - |
| 3, 4 | Seminar - 2 | | - | - |
| 5 | Seminar - 3 | | - | - |
| | | | | |
| 1, 2 | Quiz - 1 | | - | - |
| 3, 4 | Quiz - 2 | | - | - |
| 5 | Quiz - 3 | | - | - |
| | | | | |
| 1 - 5 | Other Activities – Mini Project | - | | |
| | **Final CIA Marks** | **40** | **CO1, CO10** | **L2-L4** |

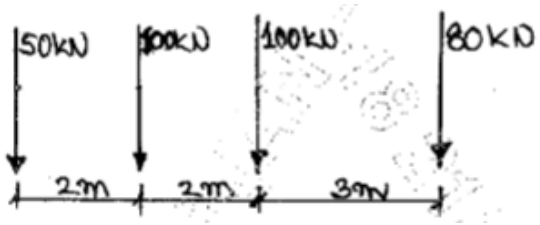
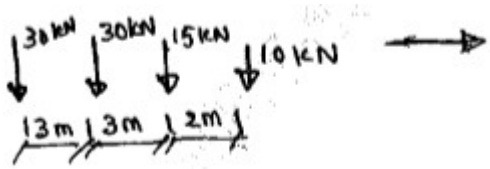
# D1. TEACHING PLAN - 1

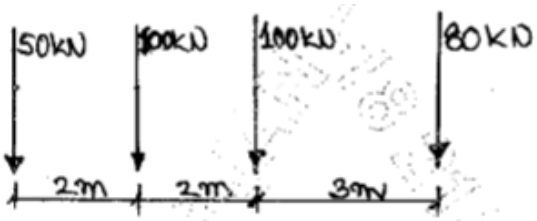
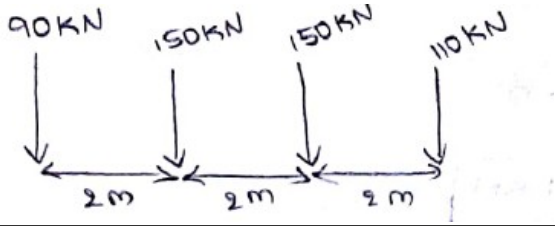
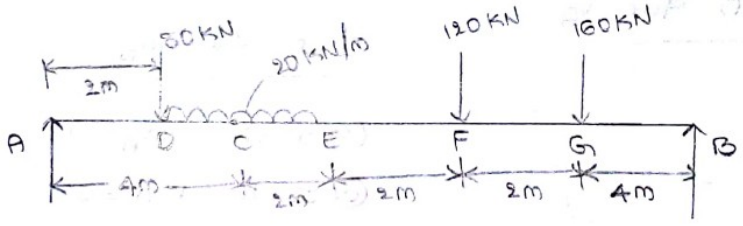
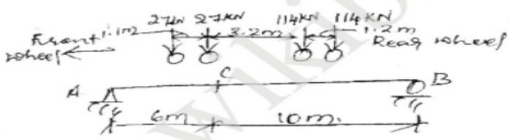
## Module - 1

| Title: | **Introduction and Analysis of Plane Trusses** | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | **CO** | **Blooms** |
| | Understand different forms of structural systems and Analyse the structure for DOF and drawing ILD Diagram. | 1 | **L4** |
| | | | |
| **b** | ***Course Schedule*** | - | - |
| **Class No** | **Portion covered per hour** | **-** | **-** |
| 1 | Structural forms, Conditions of equilibrium. | 1 | L2 |
| 2 | Compatibility conditions, Degree of freedom. | 1 | L2 |
| 3 | Linear and non linear analysis, Static and kinematic indeterminacy of structural systems. | 1 | L2 |
| 4 | Problems, | 1 | L4 |
| 5 | Problems, | 1 | L4 |
| 6 | Concepts of influence lines-ILD for reactions, SF and BM for determinate beams-ILD for axial forces in determinate trusses and | 1 | L2 |
| 7 | numerical problems | 1 | L4 |
| 8 | numerical problems | 1 | L4 |
| 9 | numerical problems | 1 | L4 |
| 10 | numerical problems | 1 | L4 |
| | | | |
| **c** | **Application Areas** | | |
| - | Students should be able employ / apply the Module learnings to . . . | | |
| 1 | Used to Determine the structure for its determinacy, and to study the behaviour of structure for its unit loads through ILD. | | |
| 2 | Used for the design of Reinforced cement concrete, Pre-stressed concrete, steel and Marine structures. | | |
| | | | |
| **d** | **Review Questions** | | |
| - | | | |
| 1 | Distinguish between Statically determinate beams and Indeterminate beams with examples. | CO1 | L2 |
| 2 | Determine static and Kinematic indeterminacy of the following.<br>  <br>Fig.Q1(c) | CO1 | L4 |
| 3 | Find the forces in all members of the pin jointed truss shown in figure<br>  | CO1 | L4 |
| 4 | Define an Influence line diagram and mention its applications. | CO1 | L2 |
| 5 | Draw the influence line diagram formation<br>1. Reactions at supports of a simply supported beam.<br>2. Shear force of a simply supported beam carrying concentrated unit load. | CO1 | L2 |
| 6 | A UDL of 15kN/m covering a length 3m crosses a girder of span 10m. Find the max. shear force and bending moment at a section 4m from the left support . | CO1 | L4 |
| | | | |
| **e** | **Experiences** | - | - |
| 1 | | CO1 | L2 |

| | | | |
|---|---|---|---|
| 2 | | | |

## Module – 2

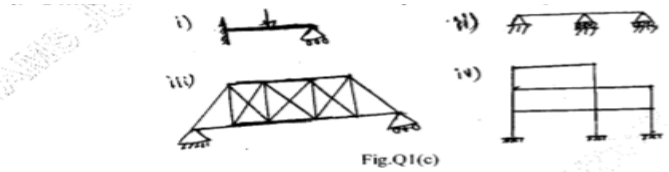
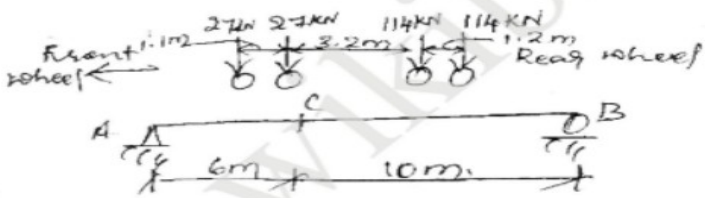
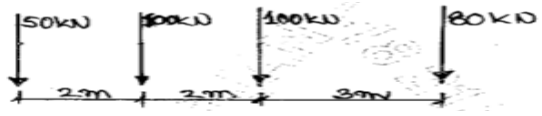
| Title: | Moving Loads | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | **CO** | **Blooms** |
| - | | - | **Level** |
| | Understand concept of moving loads and Analyse for the same. | 2 | L4 |
| **b** | ***Course Schedule*** | - | - |
| **Class No** | **Portion covered per hour** | **-** | **-** |
| 11 | Reactions, BM and SF in determinate beams, axial forces in determinate trusses for rolling loads using ILD . | 2 | L2 |
| 12 | Numerical problem. | 2 | L4 |
| 13 | Numerical problem. | 2 | L4 |
| 14 | Numerical problem. | 2 | L4 |
| 15 | Numerical problem. | 2 | L4 |
| 16 | Numerical problem. | 2 | L4 |
| 17 | Numerical problem. | 2 | L4 |
| 18 | Numerical problem. | 2 | L4 |
| 19 | Numerical problem. | 2 | L4 |
| 20 | Numerical problem. | 2 | L4 |
| | | | |
| **c** | **Application Areas** | **-** | **-** |
| - | Students should be able employ / apply the Module learnings to . . . | - | - |
| 1 | Used to Determine the reactions, shear force and Bending moment for the moving loads for different load conditions. | | |
| 2 | Used for the design of Reinforced cement concrete, Pre-stressed concrete, steel and Marine structures. | | |
| | | | |
| **d** | **Review Questions** | - | - |
| - | | | |
| 1 | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.<br>  <br>1. Maximum Reactions<br>2. Maximum bending moment at 8m from the left support. | 2 | L4 |
| 2 | A simple girder of 20m span is traversed by a moving uniformly distributed load of 6m length with an intensity of 20kn/m from left to right. Find the maximum bending moment and maximum positive and negative shear forces at sections 4m from left support. Also find the absolute maximum bending moment that may occur anywhere in the girder. | 2 | L4 |
| 3 | Using relevant influence line diagram find 1. Maximum bending moment 2) The maximum positive and negative shear forces at 4m from left support of a simply supported girder of span 10m, when a train of 4 wheel loads of 10KN, 15KN, 30KN, and 30KN spaced at 2m, 3m and 3m respectively cross the span left to right with 10KN load leading.<br>  | 2 | L4 |

| | | | |
|---|---|---|---|
| | | | |
| 4 | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.<br>  <br>1. Maximum Reactions<br>2. Maximum bending moment at 8m from the left support. | 2 | L4 |
| 5 | The multiple point loads 100kN, 120kN, 80kN and 150kN with a spacing of 2m crosses a girder of span 30m from left to right with a 100kN load bearing. Calculate 1) Reactions. 2)Maximum Shear Force at a section 10m from the left. 3)Maximum BM at a section 10m from the left. 4) Absolute max SF .5) Absolute Maximum Bending Moment. | 2 | L4 |
| 6 | For a simply supported beam of span 25m compute by influence line principle 1)Maximum bending moment at 8m from the left 2) Absolute maximum BM. 3) Maximum reaction. A Series of concentrated Loads to be taken as a rolling load system is as shown in the figure.<br>  | 2 | L4 |
| 7 | Using ILD Determine Shear force and BM at section C in the Simply supported beam as shown in the figure.<br>  | 2 | L4 |
| 8 | Determine Maximum moment and shear force at point C .The loading is due to axial loads of IRC Class A driving vehicle on top of the beam. Assume that the Vehicle can move in either directions.<br>  | | |
| **e** | **Experiences** | - | - |
| 1 | | CO3 | L2 |
| 2 | | | |

# E1. CIA EXAM – 1

## a. Model Question Paper - 1

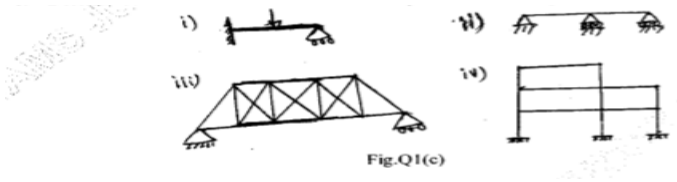
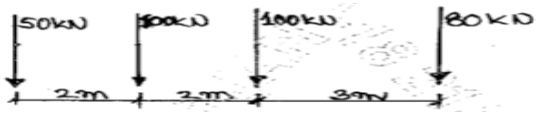
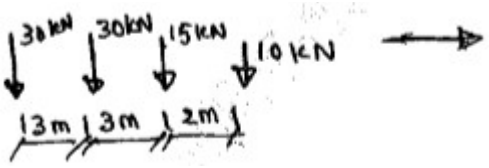
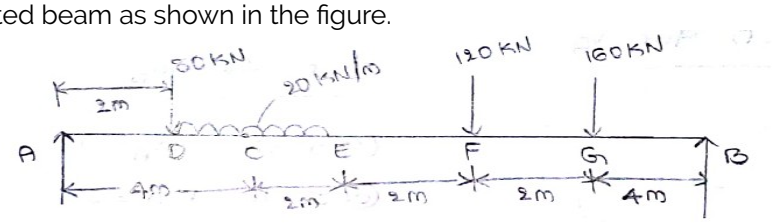
| Crs Code: | 18CV42 | Sem: | IV | Marks: | 30 | Time: | 75 minutes |
|---|---|---|---|---|---|---|---|
| Course: | Analysis of Determinate Structures. | | | | | | |

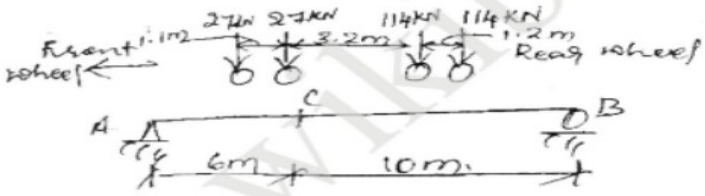
| M | Q | Note: Answer all questions, each carry equal marks. Module : 1, 2 | Marks | CO | Level |
|---|---|---|---|---|---|
| 1 | 1 | Distinguish between Statically determinate beams and Indeterminate beams with examples. | 5 | 1 | L2 |
| | 2 | Briefly explain different forms of structure? | 5 | 1 | L2 |
| | 3 | Define Linear and non-linear structure, Compatibility conditions? | 5 | 1 | L2 |
| | 4 | Determine static and Kinematic indeterminacy of the following.   Fig.Q1(c) | 12 | 1 | L4 |
| | 5 | Define a Influence line diagram and mention its applications. | 5 | 1 | L2 |
| | | | | | |
| 2 | 1 | Determine Maximum moment and shear force at point C .The loading is due to axial loads of IRC Class A driving vehicle on top of the beam. Assume that the Vehicle can move in either directions.   | 15 | 2 | L4 |
| | 2 | The multiple point loads 100kN, 120kN, 80kN and 150kN with a spacing of 2m crosses a girder of span 30m from left to right with a 100kN load bearing. Calculate 1) Reactions. 2)Maximum Shear Force at a section 10m from the left.3)Maximum BM at a section 10m from the left. 4) Absolute max SF . 5) Absolute Maximum Bending Moment. | 15 | 2 | L4 |
| | 3 | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.   1Maximum Reactions 2. Maximum bending moment at 8m from the left support. | 15 | 2 | L4 |

## b. Assignment -1

| Model Assignment Questions |
|---|

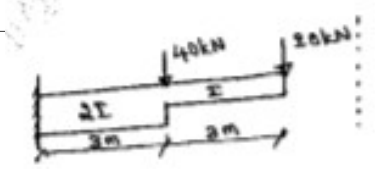
| Crs Code: | 18CV42 | Sem: | IV | Marks: | 10 | Time: | 75 minutes. |
|---|---|---|---|---|---|---|---|
| Course: | Analysis of Determinate Structures. | | | | | | |

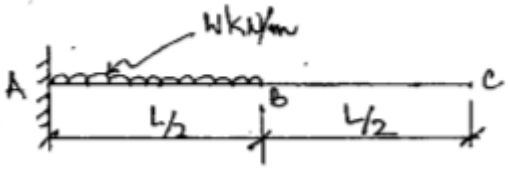
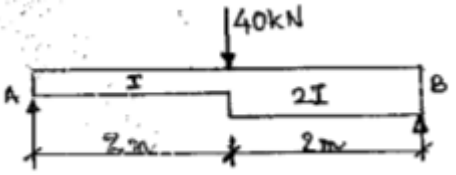
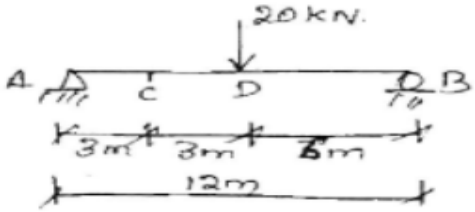
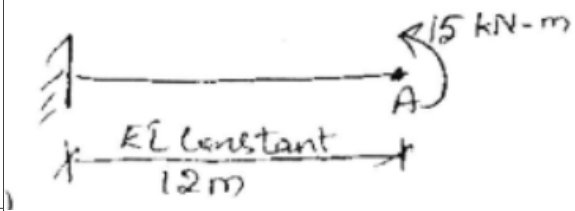
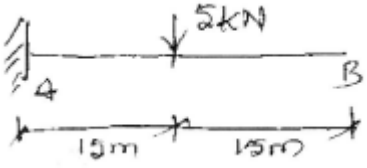
| SNo | Assignment Description | Marks | CO | Level |
|---|---|---|---|---|
| 1 | Distinguish between Statically determinate beams and Indeterminate beams with examples. | 4 | 1 | L2 |
| 2 | Determine static and Kinematic indeterminacy of the following.<br>  <br>Fig.Q1(c) | 12 | 1 | L4 |
| 3 | Briefly explain different forms of structure? | 4 | 1 | L2 |
| 4 | State the assumptions made in the analysis of truss? | 5 | 1 | L2 |
| 5 | Define a Influence line diagram and mention its applications. | 07 | 1 | L2 |
| 6 | Draw the influence line diagram formation<br>1. Reactions at supports of a simply supported beam.<br>2. Shear force of a simply supported beam carrying concentrated unit load | 08 | 1 | L4 |
| 7 | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.<br>  <br>1Maximum Reactions<br>2. Maximum bending moment at 8m from the left support. | 15 | 2 | L4 |
| 8 | A simple girder of 20m span is traversed by a moving uniformly distributed load of 6m length with an intensity of 20kn/m from left to right. Find the maximum bending moment and maximum positive and negative shear forces at sections 4m from left support. Also find the absolute maximum bending moment that may occur anywhere in the girder. | 15 | 2 | L4 |
| 9 | Using relevant influence line diagram find 1. Maximum bending moment 2) The maximum positive and negative shear forces at 4m from left support of a simply supported girder of span 10m, when a train of 4 wheel loads of 10KN, 15KN, 30KN, and 30KN spaced at 2m, 3m and 3m repectively cross the span left to right with 10KN load leading.<br>  | 15 | 2 | L4 |
| | The multiple point loads 100kN, 120kN, 80kN and 150kN with a spacing of 2m crosses a girder of span 30m from left to right with a 100kN load bearing. Calculate 1) Reactions. 2)Maximum Shear Force at a section 10m from the left.3)Maximum BM at a section 10m from the left. 4) Absolute max SF .<br>5) Absolute Maximum Bending Moment. | 15 | 2 | L4 |
| 10 | Using ILD Determine Shear force and BM at section C in the Simply supported beam as shown in the figure.<br>  | 15 | 2 | L4 |

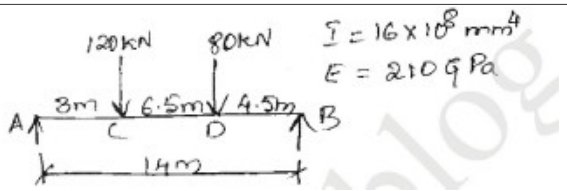
| | | | | |
|---|---|---|---|---|
| | | | | |
| 11 | Determine Maximum moment and shear force at point C .The loading is due to axial loads of IRC Class A driving vehicle on top of the beam. Assume that the Vehicle can move in either directions.<br>  | 15 | 2 | L4 |

## D2. TEACHING PLAN - 2

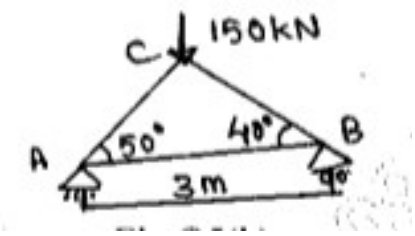
### Module – 3

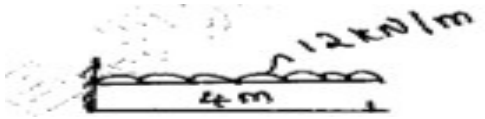
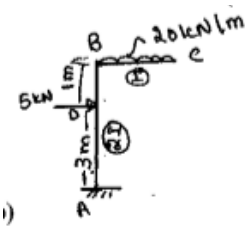
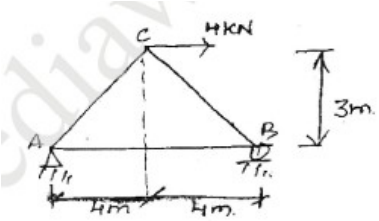
| Title: | Deflection of Beams | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | **CO** | **Blooms** |
| - | At the end of the topic the student should be able to . . . | - | **Level** |
| 1 | Analyse slopes and deflections of beams and trusses. | 3 | L4 |
| | | | |
| **b** | ***Course Schedule*** | | |
| **Class No** | **Portion covered per hour** | **-** | **-** |
| 21 | Moment area method. | 3 | L2 |
| 22 | Derivation, Mohr's theorems, Sign conventions, | 3 | L2 |
| 23 | Application of moment area method for determinate prismatic beams, | 3 | L2 |
| 24 | Numerical Problems. | 3 | L4 |
| 25 | Numerical Problems. | 3 | L4 |
| 26 | Beams of varying section, Use of moment diagram by parts. | 3 | L2 |
| 27 | Conjugate beam method: Real beam and conjugate beam, conjugate beam theorems, Application of conjugate beam method of determinate beams of variable cross sections. | 3 | L2 |
| 28 | Numerical Problems. | 3 | L4 |
| 29 | Numerical Problems. | 3 | L4 |
| 30 | Numerical Problems. | 3 | L4 |
| | | | |
| **c** | **Application Areas** | **-** | **-** |
| - | Students should be able employ / apply the Module learnings to . . . | - | - |
| 1 | Used to determine the slope and Deflection of the beams by using different methods. | 3 | L4 |
| 2 | Used for the design of Reinforced cement concrete, Pre-stressed concrete, steel and Marine structures. | 3 | L4 |
| | | | |
| **d** | **Review Questions** | - | - |
| - | The attainment of the module learning assessed through following questions | - | - |
| 1 | Derive moment curvature equation. | CO3 | L4 |
| 2 | A beam of length 6m is simply supported at its ends and carries a point load of 40KN at a distance of 4m from the left support. Find the slopes at the supported ends and deflection under the load by Maculay's method. | C03 | L4 |
| 3 | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.<br>  | CO3 | L4 |

| | | | |
|---|---|---|---|
| | | | |
| 4 | Find the deflection under the concentrated load for the beam shown in figure using conjugate beam method. EI= 40000 KN-M$^2$   | CO3 | L4 |
| 5 | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.   | CO3 | L4 |
| 6 | Find the slope and deflection at the free end of the cantilever beam shown in figure by conjugate beam method.   | CO3 | L4 |
| 7 | Determine the slope @ point C of the beam in moment area method. E=200GPa. I=6x10^6 mm$^4$.   | CO3 | L4 |
| 8 | By double integration method, determine slope and deflection at A for beam shown.   | CO3 | L4 |
| 9 | Using Conjugate beam method, determine the slope and deflection @ point B of the beam shown in fig EI is constant.   | CO3 | L4 |
| 10 | Using Machaulay's method of deflection , Calculate the deflection under two loads and maximum deflection for the beam shown. | CO3 | L4 |

| | | | |
|---|---|---|---|
| |  | | |
| **e** | **Experiences** | - | - |
| 1 | | CO6 | L2 |
| 2 | | | |

## Module – 4

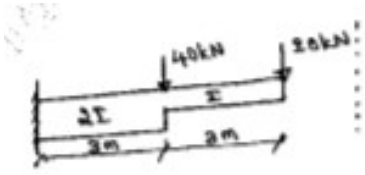
| Title: | Energy Principles and Energy Theorems | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | **CO** | **Blooms** |
| - | At the end of the topic the student should be able to . . . | - | **Level** |
| 1 | Understand concept of Energy Principles , Energy Theorems and find out Deflection in beams . | 4 | L4 |
| | | | |
| **b** | ***Course Schedule*** | | |
| **Class No** | **Portion covered per hour** | **-** | **-** |
| 31 | Principle of virtual displacements, Principle of virtual forces, Strain energy and complimentary energy, | 4 | L2 |
| 32 | Strain energy due to axial force, bending, shear and torsion, | 4 | L2 |
| 33 | Deflection of determinate beams and trusses using total strain energy, | 4 | L2 |
| 34 | Deflection at the point of application of single load, | 4 | L2 |
| 35 | Numerical Problems. | 4 | L4 |
| 36 | Numerical Problems. | 4 | L4 |
| 37 | Numerical Problems. | 4 | L4 |
| 38 | Numerical Problems. | 4 | L4 |
| 39 | Castig liano's theorems and its application to estimate the deflections of trusses, bent frames, | 4 | L2 |
| 40 | Special applications-Dummy unit load method. | 4 | L2 |
| | | | |
| **c** | **Application Areas** | **-** | **-** |
| - | Students should be able employ / apply the Module learnings to . . . | - | - |
| 1 | Used to determine the Energy principals and Energy theorems for the given structures. | 4 | L4 |
| 2 | Used for the design of Reinforced cement concrete, Pre-stressed concrete, steel and Marine structures. | 4 | L4 |
| | | | |
| **d** | **Review Questions** | - | - |
| - | The attainment of the module learning assessed through following questions | - | - |
| 1 | State 1) Castigilano's theorem 2) Principle of virtual work. | C04 | L2 |
| 2 | Determine the vertical deflection at joint C of the truss shown in fig. Take E=200x10$^6$ KN/m$^2$ and cross sectional area of each bar as 150x10$^{-6}$ m$^2$  | C04 | L4 |
| 3 | Determine the deflection of the cantilever beam shown in figure at its free end, by castigilano's method. Take EI= 12000Nm$^2$ | c04 | L4 |

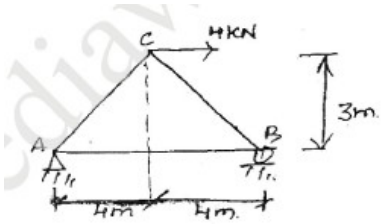
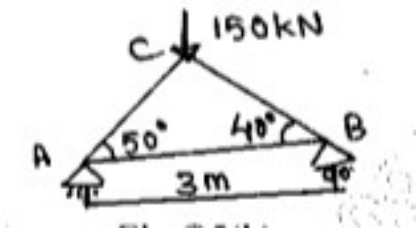
| | | | |
|---|---|---|---|
| |  | | |
| 4 | Determine the vertical and horizontal deflection at the end C of the bent frame shown in figure by unit load method. Take E=200GPA and I=6x10$^7$ mm$^4$  | CO4 | L4 |
| 5 | Explain the principles of virtual displacement and forces? | co4 | L4 |
| 6 | Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm$^2$. E=200GPa.  | co4 | L4 |
| 7 | Derive strain energy in an axially loaded member? | co4 | L4 |
| 8 | A beam AB is simply supported over a span 5m in length. A concentrated load of 30kN is acting at a section 1.25m from left support A . Calculate the deflection under the load point using dummy unit load method .E=200x10$^6$ kN/m$^2$ , I=13x10$^6$ m$^4$. | co4 | L4 |
| **e** | **Experiences** | - | - |
| 1 | | CO7 | L2 |
| 2 | | | |

## E2. CIA EXAM – 2

### a. Model Question Paper - 2

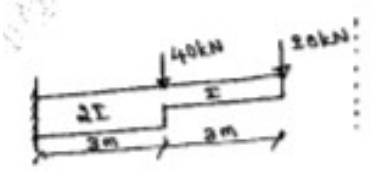
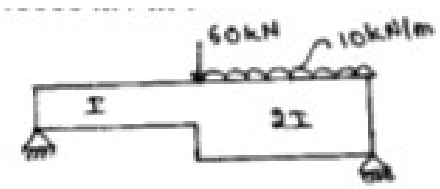
| Crs Code: | 18CV42 | Sem: | IV | Marks: | 30 | Time: | 75 minutes |
|---|---|---|---|---|---|---|---|
| Course: | Analysis of Determinate Structures. | | | | | | |

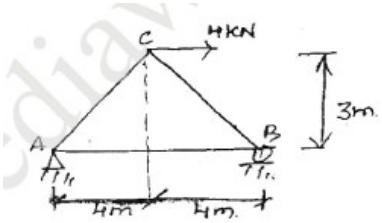
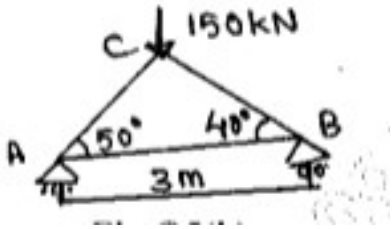
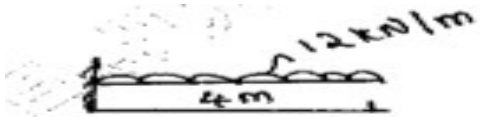
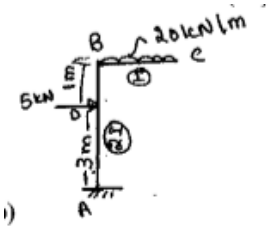
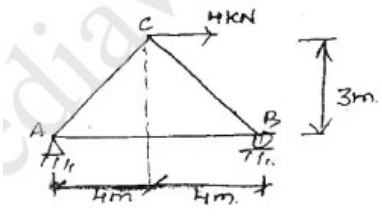
| - | - | **Note: Answer all questions, each carry equal marks. Module : 3, 4** | **Marks** | **CO** | **Level** |
|---|---|---|---|---|---|
| 1 | a | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.  | 16 | CO4 | L4 |
| | | **OR** | | | |
| 2 | a | Find the deflection under the concentrated load for the beam shown in figure using conjugate beam method. EI= 40000 KN-M$^2$  | 16 | CO4 | L4 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| 3 | a | Explain the principles of virtual displacement and forces? | 06 | CO4 | L4 |
| | b | Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm$^2$. E=200GPa.   | 10 | CO4 | L4 |
| | | **or** | | | |
| 4 | a | State 1) Castigilano's theorem 2) Principle of virtual work. | 06 | CO4 | L2 |
| | b | Determine the vertical deflection at joint C of the truss shown in fig. Take E=200x10$^6$ KN/m$^2$ and cross sectional area of each bar as 150x10$^{-6}$ m$^2$   | 10 | CO4 | L4 |
| | | | | | |

## b. Assignment – 2

| Model Assignment Questions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crs Code: | 18CV42 | Sem: | IV | Marks: | 10 | Time: | 75 minutes |
| Course: | Analysis of Determinate Structures. | | | | | | |

| SNo | Assignment Description | Marks | CO | Level |
|---|---|---|---|---|
| 1 | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.   | 16 | CO4 | L4 |
| 2 | Find the deflection under the concentrated load for the beam shown in figure using conjugate beam method. EI= 40000 KN-M$^2$   | 16 | CO4 | L4 |

| | | | | |
|---|---|---|---|---|
| 3 | Explain the principles of virtual displacement and forces? | 06 | co4 | L4 |
| 4 | Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm$^2$. E=200GPa.   | 10 | co4 | L4 |
| 5 | State 1) Castigilano's theorem 2) Principle of virtual work. | 06 | C04 | L2 |
| 6 | Determine the vertical deflection at joint C of the truss shown in fig. Take E=200x10$^6$ KN/m$^2$ and cross sectional area of each bar as 150x10$^{-6}$ m$^2$   | 10 | C04 | L4 |
| 7 | Determine the deflection of the cantilever beam shown in figure at its free end, by castigilano's method. Take EI= 12000Nm$^2$   | 16 | co4 | L4 |
| 8 | Determine the vertical and horizontal deflection at the end C of the bent frame shown in figure by unit load method. Take E=200GPA and I=6x10$^7$ mm$^4$   | 16 | CO4 | L4 |
| 9 | Explain the principles of virtual displacement and forces? | 06 | co4 | L4 |
| 10 | Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm$^2$. E=200GPa.   | 16 | co4 | L4 |

# D3. TEACHING PLAN - 3

## Module – 5

| Title: | Arches and Cable Structures | Appr Time: | 10 Hrs |
|---|---|---|---|
| **a** | ***Course Outcomes*** | **CO** | **Blooms** |
| - | At the end of the topic the student should be able to . . . | - | **Level** |
| 1 | Analyse arches and cables. | 5 | L4 |
| | | | |
| **b** | ***Course Schedule*** | - | - |
| **Class No** | **Portion covered per hour** | **-** | **-** |
| 41 | Three hinged parabolic and circular arches with supports at the same and different levels. Determination of normal thrust, radial shear and bending moment. | 5 | L2 |
| 42 | Numerical problems | 5 | L4 |
| 43 | Numerical problems | 5 | L4 |
| 44 | Numerical problems | 5 | L4 |
| 45 | Numerical problems | 5 | L4 |
| 46 | Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension cables. | 5 | L2 |
| 47 | Numerical problems | 5 | L4 |
| 48 | Numerical problems | 5 | L4 |
| 49 | Numerical problems | 5 | L4 |
| 50 | Numerical problems | 5 | L4 |
| | | | |
| **c** | **Application Areas** | **-** | **-** |
| - | Students should be able employ / apply the Module learnings to . . . | - | - |
| 1 | Used to determine the reactions, Bending moment and Shear force for arches and Cables. | 5 | L4 |
| 2 | Used for the design of Reinforced cement concrete, Pre-stressed concrete, steel and Marine structures. | 5 | L4 |
| | | | |
| **d** | **Review Questions** | - | - |
| - | The attainment of the module learning assessed through following questions | - | - |
| 1 | A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75KN at 18m from the left support and UDL of 45KN/m over the left half of the portion. Find out the resultant reactions. Also determine the B.M, Normal thrust and radial shear at a section 6m from the left support. | CO5 | L4 |
| 2 | A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a UDL of 20KN/m. Determine<br>1. the maximum and minimum tension in the cable<br>2. Length of the cable<br>3. the size of cable if the permissible stress of cable material is 200N/mm$^2$ | CO5 | L4 |
| 3 | A three hinged parabolic arch has a span of 16m and a central rise of 4m. It carries a point load of 100 kN @ 4m from the left support. Find out the resultant reactions. Also Evaluate the B.M, Normal thrust and radial shear at a section 6m from the left support. Take the equation of arch y=4h x(l-x) with left hand support as origion. | CO5 | L4 |
| 4 | Derive the expression for the length of cable for supports at same level. | CO5 | L4 |
| 5 | Derive the expression for the length of cable for supports at different level. | CO5 | L2 |
| 6 | A footbridge of width 3m and span 50 m is carried by 2 cables of uniform section having a central dip of 5m. If the platform load is 5kN/m$^2$ . Calculate the maximum pull in the cables. Find the necessary section area required if the allowable stress is 120N/mm$^2$. | CO5 | L4 |
| | | | |

| | | | |
|---|---|---|---|
| **e** | **Experiences** | - | - |
| 1 | | CO10 | L2 |
| 2 | | CO9 | |

# E3. CIA EXAM – 3

## a. Model Question Paper - 3

| Crs Code: | 18CV42 | Sem: | IV | Marks: | 30 | Time: | 75 minutes |
|---|---|---|---|---|---|---|---|
| Course: | Analysis of Determinate Structures. | | | | | | |

| - | - | **Note: Answer all questions, each carry equal marks. Module : 5** | **Marks** | **CO** | **Level** |
|---|---|---|---|---|---|
| 1 | a | A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75KN at 18m from the left support and UDL of 45KN/m over the left half of the portion. Find out the resultant reactions. Also determine the B.M, Normal thrust and radial shear at a section 6m from the left support. | 16 | CO5 | L4 |
| | | **OR** | | | |
| 2 | a | A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a UDL of 20KN/m. Determine<br>1. the maximum and minimum tension in the cable<br>2. Length of the cable<br>3. the size of cable if the permissible stress of cable material is 200N/mm$^2$ | 16 | CO5 | L4 |
| 3 | a | A three hinged parabolic arch has a span of 16m and a central rise of 4m. It carries a point load of 100 kN @ 4m from the left support. Find out the resultant reactions. Also Evaluate the B.M, Normal thrust and radial shear at a section 6m from the left support. Take the equation of arch y=4h x(l-x) with left hand support as origion. | 16 | CO5 | L4 |
| | | **OR** | | | |
| 4 | a | Derive the expression for the length of cable for supports at same level. | 08 | CO5 | L4 |
| | b | Derive the expression for the length of cable for supports at Different level. | 08 | CO5 | L4 |
| | | | | | |

## b. Assignment – 3

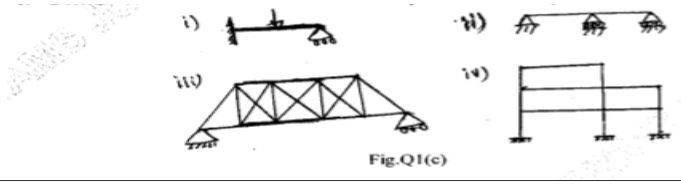
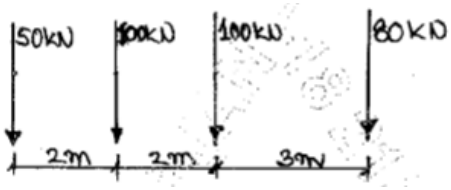
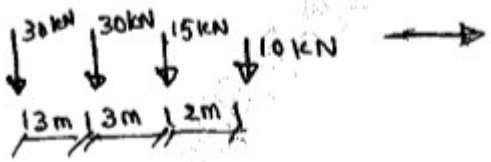
| Model Assignment Questions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Crs Code: | 18CV42 | Sem: | IV | Marks: | 10 | Time: | 75 minutes |
| Course: | Analysis of Determinate Structures. | | | | | | |

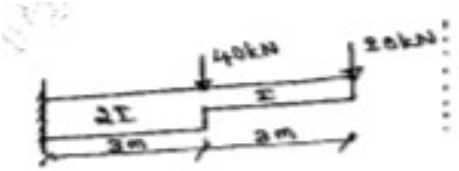
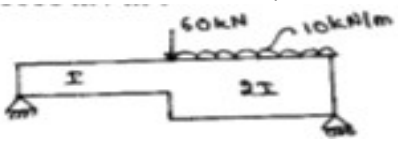
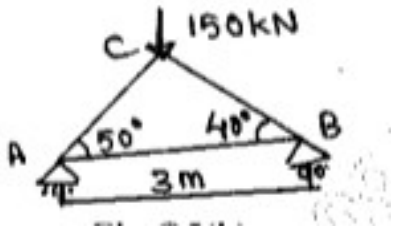
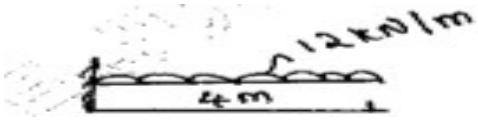
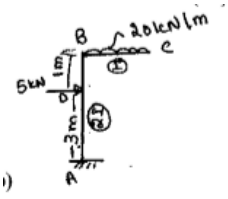
| **SNo** | **Assignment Description** | **Marks** | **CO** | **Level** |
|---|---|---|---|---|
| 1 | A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75KN at 18m from the left support and UDL of 45KN/m over the left half of the portion. Find out the resultant reactions. Also determine the B.M, Normal thrust and radial shear at a section 6m from the left support. | 16 | CO5 | L4 |
| 2 | A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a UDL of 20KN/m. Determine<br>1. the maximum and minimum tension in the cable<br>2. Length of the cable<br>3. the size of cable if the permissible stress of cable material is 200N/mm$^2$ | 16 | CO5 | L4 |
| 3 | A three hinged parabolic arch has a span of 16m and a central rise of 4m. It carries a point load of 100 kN @ 4m from the left support. Find out the resultant reactions. Also Evaluate the B.M, Normal thrust and radial | 16 | CO5 | L4 |

| | | | | |
|---|---|---|---|---|
| | shear at a section 6m from the left support. Take the equation of arch y=4h x(l-x) with left hand support as origion. | | | |
| 4 | Derive the expression for the length of cable for supports at same level. | 08 | CO5 | L4 |
| 5 | Derive the expression for the length of cable for supports at Different level. | 08 | CO5 | L4 |
| | | | | |

# F. EXAM PREPARATION

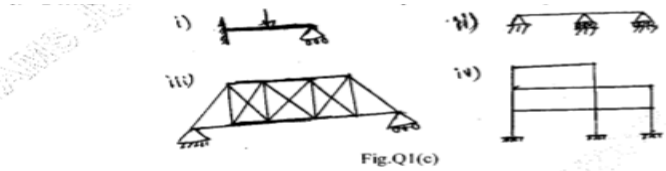
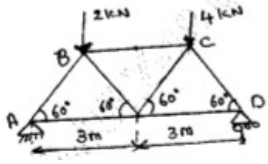
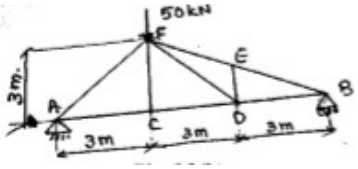
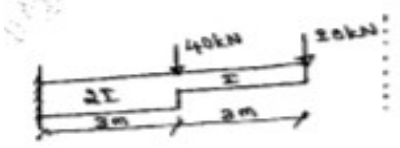
## 1. University Model Question Paper

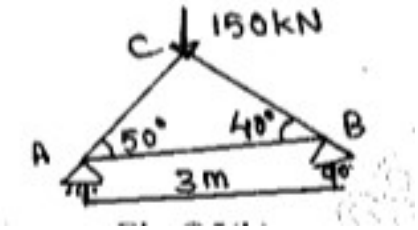
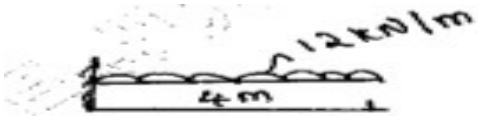
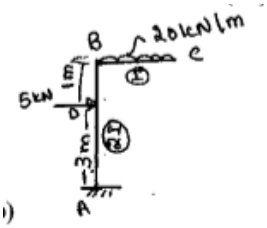
| Course: | Analysis of Determinate Structures | | | | | Month / Year | May /2018 | |
|---|---|---|---|---|---|---|---|---|
| Crs Code: | 18cv42 | Sem: | IV | Marks: | 100 | Time: | 180 minutes | |
| Module | | Answer all FIVE full questions. All questions carry equal marks. | | | | **Marks** | **CO** | **Level** |
| 1 | a | Distinguish between Statically determinate beams and Indeterminate beams with examples. | | | | 08 | CO1 | L2 |
| | b | Determine static and Kinematic indeterminacy of the following.  Fig.Q1(c) | | | | 08 | CO1 | L4 |
| | | **OR** | | | | | | |
| 2 | a | Define a Influence line diagram and mention its applications. | | | | 06 | CO1 | L2 |
| | b | Draw the influence line diagram formation<br>1. Reactions at supports of a simply supported beam.<br>2. Shear force of a simply supported beam carrying concentrated unit load | | | | 10 | CO1 | L4 |
| | | **Module 2** | | | | | | |
| 3 | a | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.   1. Maximum Reactions<br>2. Maximum bending moment at 8m from the left support. | | | | 16 | CO2 | L4 |
| | | **OR** | | | | | | |
| 4 | a | Using relevant influence line diagram find 1. Maximum bending moment 2) The maximum positive and negative shear forces at 4m from left support of a simply supported girder of span 10m, when a train of 4 wheel loads of 10KN, 15KN, 30KN, and 30KN spaced at 2m, 3m and 3m repectively cross the span left to right with 10KN load leading.   | | | | 16 | CO2 | L4 |
| | | **Module 3** | | | | | | |

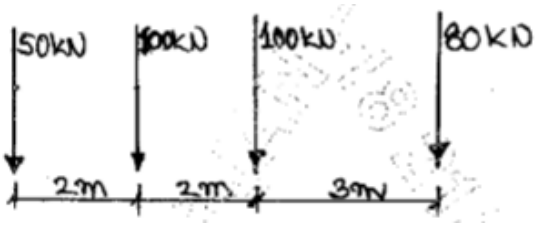
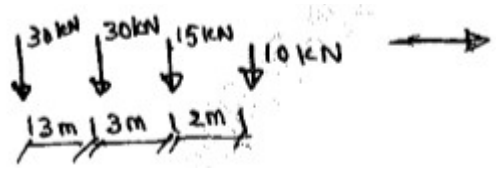
| | | | | | |
|---|---|---|---|---|---|
| 5 | a | Derive moment curvature equation. | 06 | CO3 | L2 |
| | b | A beam of length 6m is simply supported at its ends and carries a point load of 40KN at a distance of 4m from the left support. Find the slopes at the supported ends and deflection under the load by Maculay's method. | 10 | C03 | L4 |
| | | **OR** | | | |
| 6 | a | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.   | 08 | CO3 | L4 |
| | b | Find the deflection under the concentrated load for the beam shown in figure using conjugate beam method. EI= 40000 KN-M$^2$   | 08 | CO3 | L4 |
| | | **Module 4** | | | |
| 7 | a | State 1) Castigilano's theorem 2) Principle of virtual work. | 06 | C04 | L2 |
| | b | Determine the vertical deflection at joint C of the truss shown in fig. Take E=200x10$^6$ KN/m$^2$ and cross sectional area of each bar as 150x10$^{-6}$ m$^2$   | 10 | C04 | L4 |
| | | **OR** | | | |
| 8 | a | Determine the deflection of the cantilever beam shown in figure at its free end, by castigilano's method. Take EI= 12000Nm$^2$   | 08 | co4 | L4 |
| | b | Determine the vertical and horizontal deflection at the end C of the bent frame shown in figure by unit load method. Take E=200GPA and I=6x10$^7$ mm$^4$   | 08 | CO4 | L4 |
| | | **Module 5** | | | |
| 9 | | A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75KN at 18m from the left support and UDL of 45KN/m over the left half of the portion. Find out the resultant reactions. Also determine the B.M, Normal thrust and radial shear at a section 6m from the left support. | 16 | CO5 | L4 |

| | | | | | |
|---|---|---|---|---|---|
| | | **OR** | | | |
| 10 | | A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a UDL of 20KN/m. Determine<br>1. the maximum and minimum tension in the cable<br>2. Length of the cable<br>3. the size of cable if the permissible stress of cable material is 200N/mm$^2$ | 16 | co5 | L4 |

## 2. SEE Important Questions

| Course: | | Analysis of Determinate Structures | | | | | Month / Year | May /2020 |
|---|---|---|---|---|---|---|---|---|
| Crs Code: | | 18cv42 | Sem: | IV | Marks: | 100 | Time: | 180 minutes |
| | **Note** | Answer all FIVE full questions. All questions carry equal marks. | | | | | - | - |
| Module | Qno. | Important Question | | | | | **Marks** | **CO** | **Year** |
| 1 | 1 | Distinguish between Statically determinate beams and Indeterminate beams with examples. | | | | | 08 | CO1 | L2 |
| | 2 | Determine static and Kinematic indeterminacy of the following.<br>  <br>Fig.Q1(c) | | | | | 08 | CO1 | L4 |
| | 3 | Find the forces in all members of the pin jointed truss shown in figure<br>  | | | | | 06 | CO1 | L4 |
| | 4 | Determine the nature and magnitude of forces of members FE, FD, CD by methods of sections for the truss shown in fig below<br>  | | | | | 10 | C01 | L4 |
| | | | | | | | | | |
| 2 | 1 | Derive moment curvature equation. | | | | | 06 | CO2 | L4 |
| | 2 | A beam of length 6m is simply supported at its ends and carries a point load of 40KN at a distance of 4m from the left support. Find the slopes at the supported ends and deflection under the load by Maculay's method. | | | | | 10 | C02 | L4 |
| | 3 | Find the slope and deflection at the free end of the cantilever beam shown in figure by moment area method.<br>  | | | | | 08 | CO2 | L4 |
| | 4 | Find the deflection under the concentrated load for the beam shown in figure using conjugate beam method. EI= 40000 KN-M$^2$<br>  | | | | | 08 | CO2 | L4 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| 3 | 1 | State 1) Castigilano's theorem 2) Principle of virtual work. | 06 | C03 | L2 |
| | 2 | Determine the vertical deflection at joint C of the truss shown in fig. Take $E=200x10^6$ KN/m$^2$ and cross sectional area of each bar as $150x10^{-6}$ m$^2$   | 10 | C03 | L4 |
| | 3 | Determine the deflection of the cantilever beam shown in figure at its free end, by castigilano's method. Take EI= 12000Nm$^2$   | 08 | co3 | L4 |
| | 4 | Determine the vertical and horizontal deflection at the end C of the bent frame shown in figure by unit load method. Take E=200GPA and I=$6x10^7$ mm$^4$   | 08 | CO3 | L4 |
| | | | | | |
| 4 | 1 | A three hinged parabolic arch has a span of 24m and a central rise of 4m. It carries a concentrated load of 75KN at 18m from the left support and UDL of 45KN/m over the left half of the portion. Find out the resultant reactions. Also determine the B.M, Normal thrust and radial shear at a section 6m from the left support. | 16 | CO4 | L4 |
| | 2 | A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a UDL of 20KN/m. Determine<br>1. the maximum and minimum tension in the cable<br>2. Length of the cable<br>3. the size of cable if the permissible stress of cable material is 200N/mm$^2$ | 16 | co4 | L4 |
| | | | | | |
| 5 | 1 | Define a Influence line diagram and mention its applications. | 07 | CO5 | L2 |
| | 2 | Draw the influence line diagram formation<br>1. Reactions at supports of a simply supported beam.<br>2. Shear force of a simply supported beam carrying concentrated unit | 08 | CO5 | L4 |

| | | | | | |
|---|---|---|---|---|---|
| | | load | | | |
| | 3 | For a simply supported beam of span 25m with the series of concentrated loads to be taken as rolling load system as shown in figure. Compute the following by influence line principles.<br>  <br>1. Maximum Reactions<br>2. Maximum bending moment at 8m from the left support. | 15 | CO5 | L4 |
| | 4 | A simple girder of 20m span is traversed by a moving uniformly distributed load of 6m length with an intensity of 20kn/m from left to right. Find the maximum bending moment and maximum positive and negative shear forces at sections 4m from left support. Also find the absolute maximum bending moment that may occur anywhere in the girder. | 15 | CO5 | L4 |
| | 5 | Using relevant influence line diagram find 1. Maximum bending moment 2) The maximum positive and negative shear forces at 4m from left support of a simply supported girder of span 10m, when a train of 4 wheel loads of 10KN, 15KN, 30KN, and 30KN spaced at 2m, 3m and 3m respectively cross the span left to right with 10KN load leading.<br>  | 15 | CO5 | L4 |

# Course Outcome Computation

**Academic Year:**

**Odd / Even semester**

| **INTERNAL TEST** | **T1** | | | | | | **T2** | | | | | | **T3** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcome** | **CO 1** | | **CO 2** | | **CO 3** | | **CO 4** | | **CO 5** | | **CO 6** | | **CO7** | | **CO 8** | |
| **QUESTION NO** | **Q1** | **LV** | **Q2** | **LV** | **Q3** | **LV** | **Q1** | **LV** | **Q2** | **LV** | **Q3** | **LV** | **Q1** | **LV** | **Q2** | **LV** |
| MAX MARKS | | | | | | | | | | | | | | | | |
| USN-1 | | | | | | | | | | | | | | | | |
| USN-2 | | | | | | | | | | | | | | | | |
| USN-3 | | | | | | | | | | | | | | | | |
| USN-4 | | | | | | | | | | | | | | | | |
| USN-5 | | | | | | | | | | | | | | | | |
| USN-6 | | | | | | | | | | | | | | | | |
| Average CO Attainment | | | | | | | | | | | | | | | | |

**LV Threshold : 3:>60%, 2:>=50% and <=60%, 1: <=49%**
**CO1 Computation :(2+2+2+3)/4 = 10/4=2.5**

# PO Computation

| Program Outcome | PO1 | PO3 | PO3 | PO1 | PO12 | PO12 | PO6 | PO1 |
|---|---|---|---|---|---|---|---|---|
| Weight of CO - PO | | | | | | | | |
| Course Outcome | CO1 | CO2 | CO3 | CO4 | CO5 | CO6 | CO7 | CO8 |
| Test/Quiz/Lab | T1 | | | T2 | | | T3 | |
| QUESTION NO | Q1 | LV | Q2 | LV | Q3 | LV | Q1 | LV | Q2 | LV | Q3 | LV | Q1 | LV | Q2 | LV |
| MAX MARKS | | | | | | | | | | | | | | | | |
| USN-1 | | | | | | | | | | | | | | | | |
| USN-2 | | | | | | | | | | | | | | | | |
| USN-3 | | | | | | | | | | | | | | | | |
| USN-4 | | | | | | | | | | | | | | | | |
| USN-5 | | | | | | | | | | | | | | | | |
| USN-6 | | | | | | | | | | | | | | | | |
| Average CO Attainment | | | | | | | | | | | | | | | | |