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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Odd / Even semester	<u>25</u>

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.

Mod	Content	Teaching Hours	Blooms Learning
ule			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

	Deceareb	Docont	dovida	nmonto	on tl	ha aanaa	nta i	aublicati	one in	inurnala	conform	<u> </u>	to
3.	Research.	Recent	uevelo	prinerius	Onti	le conce	pis – j	JUDUCALI		journals,	comeren	ces e	ιC

Modul	Details	Chapters	Availability
es	Taxt backs (Title Authors Edition Dublisher Veer)	IN DOOK	
A	1 Peddy C.S. Basic Structural Analysis. Tata McGraw Hill, New Delhi	-	- In Lib
4, 5	Theady C 3, Dasic Structural Analysis, rata McGraw Fill, New Defil.	1, 2, 3, 4	
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,	3. Bhavikatti, Structual Analysis, Vikas Publishing House Pvt. Ltd, New	1, 2, 3, 4	In Lib
4, 5	Delhi, 2002.		
С	Concept Videos or Simulation for Understanding	-	-
	Module-1		
1	https://www.youtube.com/watch?v=AgYVQMoqUug		
2	https://www.youtube.com/watch?v=eVEN8etXkYc		
3	https://www.youtube.com/watch?v=LZoVrktwtUM&t=114s		
4	https://www.youtube.com/watch?		
	v=aNi_Zn_gQrA&list=PLjrNUPGdy6hZT9oBK7_6S		
	tK_lUE9Xtw&index=1		
5	https://www.youtube.com/watch?		
	v=Oj8hIdXukkE&list=PLjrNUPGdy6hZT9oBK7_6S		
	tK_IUE9Xtw&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=1ES78kUkf50		
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-qXzkl		
	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=WBFR_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=GOEEm4KK108		
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=d2lka5GD1oE		
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=mQBdG4Rkclc		
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

Mod ules	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.

Mod	Topic / Description	Area	Remarks	Blooms
ules				Level
3	Knowledge on analyzing determinate	Higher		Understa
	structures	Study		nd L2

B. OBE PARAMETERS

1. Course Outcomes

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

Mod	Course	Course Outcome	Teach. Hours	Instr Method	Assessme	Blooms'
ules	Code.#	At the end of the course, student			nt	Level
		should be able to			Method	

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

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

3. Articulation Matrix

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

-	-	Course Outcomes		Program Outcomes					-									
Mod	CO.#	At the end of the course	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS	Lev
ules		student should be able to	1	2	3	4	5	6	7	8	9	10	11	12	O1	02	О3	el
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.Mod
ulesGap TopicActions PlannedSchedule PlannedResources PersonPO Mapping1Seminar2nd week / dateDr XYZ, InstList from B4
above2Seminar3rd WeekUseVeek

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation.

Mod	d Title Teach. No. of question in Exam						CO	Levels		
ules		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		
							Asg			
1	Introduction and Analysis of Plane	10	4	-	-	1	1	2	CO1	L2,L4
	Trusses									
2	Deflection of beams	10	4	-	-	1	1	2	CO2	L2,L4
3	Energy Principles and Energy	10	-	4	-	1	1	2	CO3	L2,L4.
	Theorems									
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.

1000	Evaluation	V/oightogo in		
INIOC	Evaluation	weightage in	CO	Levels
ules		Marks		
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 10 Hrs Appr Time: CO Course Outcomes а Blooms Understand different forms of structural systems and Analyse the structure for 1 L4 DOF and drawing ILD Diagram. Course Schedule h Class No Portion covered per hour _ Structural forms, Conditions of equilibrium. L2 1 1 Compatibility conditions, Degree of freedom. 2 L2 1 Linear and non linear analysis, Static and kinematic L2 3 1 indeterminacy of structural systems. Problems, 4 1 L4 Problems, 5 L4 1 6 Concepts of influence lines-ILD for reactions, SF and BM for determinate L2 1 beams-ILD for axial forces in determinate trusses and 7 numerical problems L4 1 numerical problems 8 1 L4 numerical problems 9 1 L4 numerical problems L4 10 1 **Application** Areas С Students should be able employ / apply the Module learnings to ... Used to Determine the structure for its determinacy, and to study the 1 behaviour of structure for its unit loads through ILD. Used for the design of Reinforced cement concrete, Pre-stressed concrete, 2 steel and Marine structures. d **Review Questions** Distinguish between Statically determinate beams and Indeterminate beams CO1 12 1 with examples. Determine static and Kinematic indeterminacy of the following. CO1 2 L4 1 Fig.Q1(c) Find the forces in all members of the pin jointed truss shown in figure CO1 L4 3 Define an Influence line diagram and mention its applications. CO1 12 4 5 Draw the influence line diagram formation CO1 L2 1. Reactions at supports of a simply supported beam. 2. Shear force of a simply supported beam carrying concentrated unit load. A UDL of 15kN/m covering a length 3m crosses a girder of span 10m. Find the 6 CO1 L4 max. shear force and bending moment at a section 4m from the left support . Experiences е CO1 L2 1

-	
2	
_	

Module – 2

Title:	Moving Loads	Appr Time:	10 Hrs
a	Course Outcomes	СО	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	
18	Numerical problem.	2	 L4
19	Numerical problem.	2	L4
20	Numerical problem.	2	L4
с	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.		
4	Paviaw Quartiana		
a	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.	2	L4
	50kW 100kW 100kW 80kW		
	1. Maximum Reactions		
	2. Maximum bending moment at 8m from the left support.		
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.	2	L4
18CV42	$\int_{3m}^{3m} \int_{3m}^{30kN} \int_{15kN}^{15kN} \int_{10kN} \longrightarrow \text{ [ht @2017. cAAS. All right]}$	nts reserv	/ed.



E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs		18CV42	Sem:	IV	Marks:	30	Time:	75 minute	S	
Code	9:	Analycic of	Dotormin	ata Structu						
Cour	se.	Analysis of	Determin							
M	Q	Note: Ansv	ver all qu	estions, ea	ch carry equa	al marks.	Module : 1, 2	Marks	CO	Level
1	1	beams with	n between h example	Statically c es.	aeterminate b	eams and	a indeterminate	5	1	L2
	2	Briefly exp	lain differe	ent forms of	f structure?			5	1	L2
	3	Define Line	ear and no	on-linear str	ucture, Comp	atibility c	onditions?	5	1	L2
	4	Determine	static and	l Kinematic	indeterminac	cy of the f	ollowing.	12	1	L4
					Fig.Q1(c)	N) #				
	5	Define a In	fluence lir	ne diagram	and mention	its applic	ations.	5	1	L2
		Donno a m							-	
2	2	Determine due to axi Assume th	Maximun al loads at the Ver	n moment of IRC Class nicle can mo	and shear for ss A driving v ove in either c	lirections.	nt C .The loading n top of the bea <i>in the bea</i> <i>in the bea</i> <i>in the bea</i> <i>in the beach</i>	g is 15 am.	2	L4
	2	2m crosse bearing. Ca from the la max SF . 5) Absolute	s a girde alculate 1) eft.3)Maxir	n of span 3 Reactions. mum BM a m Bending	, 120kN, 80kN 30m from left 2)Maximum S t a section 10 Moment.	to right Shear For om from t	with a 100kN lo with a 100kN lo ce at a section 1 the left. 4) Absol	on om ute	2	
	3	For a simpl loads to be following b Reactions 2. Maximur	n bending	ed beam o rolling load ce line princ	f span 25m wi d system as s ciples.	th the se hown in the second the second	ries of concentra figure. Compute 1Maximum port.	ted 15	2	L4

b. Assignment -1

Model Assignment Questions

Crs C	ode: 18CV42 Sem: IV Marks: 10 Time: 75	5 minute	S.	
Cours	e: Analysis of Determinate Structures.			
SNo	Assignment Description	Marks	со	Level
1	Distinguish between Statically determinate beams and Indeterminate beams with examples.	4	1	L2
2	Determine static and Kinematic indeterminacy of the following.	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 1. Reactions at supports of a simply supported beam. 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.	15	2	L4
	1Maximum Reactions 2. Maximum bending moment at 8m from the left support.			
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.	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.	15	2	L4
	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.			
10	Using ILD Determine Shear force and BM at section C in the Simply supported beam as shown in the figure.	15	2	L4
8CV42	A D C E F G B 17. CAAS	6. All rights	s reserve	ed.

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.	15	2	L4

D2. TEACHING PLAN - 2

Module - 3

Title:	Deflection of Beams	Appr Time:	10 Hrs
а	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	p 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	12
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	3	L2
	theorems, Application of conjugate beam method of determinate beams of variable cross sections.		
28	Numerical Problems.	3	L4
29	Numerical Problems.	3	L4
30	Numerical Problems.	3	L4
с	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.	CO3	L4
1		1	1

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COURSE PLAN - CAY 2019-20

	$A = \frac{3m}{L} = \frac{6.5m}{4.5m} = \frac{3m}{R}$		
е	Experiences	-	-
1		CO6	L2
2			

Module – 4

Title:	Energy Principles and Energy Theorems	Appr Time	10 Hrs
а	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	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
С	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	-	-
-	I he 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 $E=200 \times 10^6 \text{ KN/m}^2$ and cross sectional area of each bar as $150 \times 10^{-6} \text{ m}^2$	C04	L4
	A 50° 40° B		
3	Determine the deflection of the cantilever beam shown in figure at its free end, by castigilano's method. Take EI= 12000Nm ²	CO4	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?	C04	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 , l=13x10 ⁶ m ⁴ .	C04	L4
е	Experiences	-	_
1		CO7	L2
2			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Cod	le:	18CV42	Sem:	IV	Marks:	30	Time: ;	75 minute	S	
Cou	irse:	Analysis of	Determin	ate Structu	res.					
-	-	Note: Answ	ver all que	estions, eac	ch carry equa	l marks.	Module : 3, 4	Marks	СО	Level
1	a	Find the s shown in fi	lope and gure by m	deflection oment area	at the free entropy of the	end of ti	ne cantilever bea	m 16	CO4	L4
					OR					
2	а	Find the d figure using	eflection ι g conjugat	under the c e beam me	oncentrated ethod. EI= 400	load for 00 KN-M	the beam shown 12	in 16	CO4	L4
.8CV4	2			Ĩ		1	right ©2017. cAA	AS. All rights	reserve	d.

		Evaluin the principles of virtual displacement and foreas?	06	00.4	14
3	b	Explain the principles of virtual displacement and forces? Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm ² . E=200GPa.	10	 CO4	L4 L4
		or			
4	а	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

b. Assignment – 2

				Мос	del Assignmen	t Questi	ons			
Crs Coo	de:	18CV42	Sem:	IV	Marks:	10	Time:	75 minute	minutes	
Course	:	Analysis c	of Determina	ate Struct	ures.					
SNo				Assignm	ent Descriptio	on		Marks	со	Level
1	Fin sho	d the slo own in figu	pe and de are by mome	lection a ent area r	at the free en nethod.	nd of the	e cantilever bea	n 16	CO4	L4
				14	i an					
2	Fin figu	d the def ure using c	lection und conjugate b	er the co eam meth	ncentrated lo nod. EI= 40000	ad for th KN-M ²	ne beam shown	in 16	CO4	L4
			Г	£	LOOKH ST	10keklen				
18CV42			4	,	7 -	4	oyright ©2017. cA	AS. All right	s reserve	d.

3	Explain the principles of virtual displacement and forces?	06	<u> </u>	14
4	Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm ² . E=200GPa.	10	co4	L4 L4
5	State 1) Castigilano's theorem 2) Principle of virtual work. 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	06 10	C04 C04	L2 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	C04	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 10	Explain the principles of virtual displacement and forces? Using Castigliano's theorem, Determine the virtual displacement of joint C of the truss shown A = 400mm ² . E=200GPa.	06 16	co4 co4	L4 L4

D3. TEACHING PLAN - 3

Module – 5

Title:	Arches and Cable Structures	Appr Time:	10 Hrs
а	Course Outcomes	CO	Blooms
-	At the end of the topic the student should be able to	-	Level
1	Analyse arches and cables	5	
1		5	L4
b	Course Schedule	-	-
Class No	Portion covered per hour	-	-
41	Three hinged parabolic and circular arches with supports at the same and	5	L2
	different levels. Determination of normal thrust, radial shear and bending	-	
	moment.		
42	Numerical problems	5	L4
43	Numerical problems	5	L4
44	Numerical problems	5	
45	Numerical problems	5	
46	Analysis of cables under point loads and LIDL. Length of cables for supports at	5	12
40	same and at different levels. Stiffening trusses for suspension cables	5	L
17	Numerical problems	Б	L A
47	Numerical problems	5	
40	Numerical problems	5	
49	Numerical problems	5	
- 50		5	L4
^	Application Areas	_	_
L	Application Aleas Students should be able employ (apply the Medule learnings to		-
-	Sudenis should be able employ / apply the Module learnings to	-	-
T	and Cables	5	L4
2	lised for the design of Poinforced company concrete. Pro strossed concrete	F	14
2	steel and Marine structures	5	L4
d	Paviaw Questions		_
u	The attainment of the module learning assessed through following questions		
-	A three hinged parabolic arch bas a span of 24m and a control rise of 4m. It		-
L	A three hinged parabolic archinas a span of 2411 and a central rise of 411. It	005	L4
	Latter a concentrated todu of 75kW at form from the text support and ODE of AEKN/m over the left half of the portion. Find out the resultant reactions. Also		
	determine the BM. Normal thrust and radial shear at a section 6m from the left		
	support		
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	CO5	14
	1. the maximum and minimum tension in the cable		
	2. Length of the cable		
	3. the size of cable if the permissible stress of cable material is 200N/mm ²		
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	CO5	L4
	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.		
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 tootbridge of width 3m and span 50 m is carried by 2 cables of uniform	00	
	section having a central dip of 5m. If the platform load is 5kN/m ² . Calculate the	CO5	L4
	maximum pull in the cables. Find the necessary section area required if the		
	allowable stress is 120in/mm².		
1		1	

е	Experiences	-	-
1		CO10	L2
2		CO9	

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code	Ð:	18CV42	Sem:	IV	Marks:	30	Time:	75 minut	es	
Cou	rse:	Analysis of	Determinat	e Structures.	L.					
-	-	Note: Answ	ver all ques	tions, each c	arry equal	marks. Modi	ule : 5	Mark	s CO	Level
1	a	A three hing It carries a UDL of 45k reactions. A section 6m	three hinged parabolic arch has a span of 24m and a central rise of 4m carries a concentrated load of 75KN at 18m from the left support and IDL of 45KN/m over the left half of the portion. Find out the resultant eactions. Also determine the B.M, Normal thrust and radial shear at a ection 6m from the left support.							L4
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 1. the maximum and minimum tension in the cable 2. Length of the cable 3. the size of cable if the permissible stress of cable material is					is 16	CO5	L4	
3	a	A three hing It carries a resultant re at a section with left ha	ged parabo point load o actions. Als 6 6m from th nd support	lic arch has a of 100 kN (a) o Evaluate t ne left suppo as origion.	a span of 16 4m from the he B.M, Nor ort. Take the	m and a cer e left suppo mal thrust a equation of	ntral rise of 4 rt. Find out t nd radial she arch y=4h x(l	.m. 16 he ear x)	CO5	L4
					OR					
4	а	Derive the e	expression f	for the length	n of cable fo	r supports a	t same level.	08	CO5	L4
	b	Derive the level.	expression	for the leng	gth of cable	e for suppo	rts at Differe	ent 08	CO5	L4

b. Assignment – 3

			Мс	odel Assignmei	nt Quest	ions			
Crs Code:	18CV42	Sem:	IV	Marks:	10	Time:	75 minute	es	
Course:	Analysis (of Determi	nate Struc	ctures.					
SNo			Assigi	nment Descrip	tion		Marks	со	Level
1	A three h 4m. It car and UDL resultant shear at a	inged para ries a conc of 45KN, reactions. section 6	abolic arcl centrated /m over t Also dete m from the	h has a span c load of 75KN a he left half of ermine the B.N e left support.	of 24m a t 18m fro the po 1, Norma	nd a central rise c om the left suppor rtion. Find out th al thrust and radia	of 16 t อ	CO5	L4
2	A cable is central di 1. the max 2. Length 3. the siz 200N/mr	s suspend p of 8m. It kimum and of the cab ze of cab n ²	ed betwe carries a l d minimum de de if the	en two points JDL of 20KN/n n tension in the permissible s	A and E n. Deterr cable tress of	3 120m apart and nine ⁷ cable material i	a 16 s	CO5	L4
3	A three h 4m. It carı the result	inged para ries a poin ant reactio	abolic arcl t load of 10 ons. Also E	h has a span c 00 kN @ 4m frc Evaluate the B	of 16m a om the le M, Norm	nd a central rise c eft support. Find ou nal thrust and radia	of 16 it al	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	08		
	level.		CO5	L4

F. EXAM PREPARATION

1. University Model Question Paper

Course:		Analysis of Determinate Structures Month /	' Year	May /	2018
Crs C	ode:	18cv42 Sem: IV Marks: 100 Time:		180 m	inutes
Mod		Answer all FIVE full questions. All questions carry equal marks.	Marks	CO	Level
ule					
1	а	Distinguish between Statically determinate beams and Indeterminate	08	CO1	L2
		beams with examples.			
	b	Determine static and Kinematic indeterminacy of the following.	08	CO1	L4
		Fig.01(c)			
		UR Define a Influence line diagram and mention its applications	06	CO1	
2	d b	Denne a millione line diagram formation	00	<u> </u>	
	D	Draw the initial file diagram formation 1. Protections at supports of a simply supported beam	10	COI	
		2. Shear force of a simply supported beam carrying concentrated unit	10		
		load			
		Module 2			
3	а	For a simply supported beam of span 25m with the series of concentrated		CO2	14
	0.	loads to be taken as rolling load system as shown in figure. Compute the	16	001	
		following by influence line principles.			
		SOKN BOOKN 100KN BOKN			
		$\frac{1}{2m}$ $\frac{2m}{3m}$ $\frac{3m}{4}$			
		1 Maximum Deactions			
		1. Maximum heading memort at 8m from the left support			
		2. Maximum bending moment at omnorn the tert support.			
		OR			
Δ	a	Using relevant influence line diagram find 1. Maximum bending moment	16	CU5	L4
-	G	2) The maximum positive and negative shear forces at 4m from left	10	002	
		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.			
		here and marked and the second			
		13000 13000 15KN 110KN			
		13m 13m 12m 1			
		por the t			
		and a second frequencies			
		Module 3			

5	а	Derive moment curvature equation.	06	CO3	L2
	b	A beam of length 6m is simply supported at its ends and carries a point	10	C03	L4
		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			
6	2	Find the slope and deflection at the free end of the cantilever beam			
0	a	chown in fours by moment area method	~ 8	COn	14
		shown in figure by moment area method.	00	003	Ц4
		the second second			
		Hoke Trans			
		E			
		21			
		20-1			
	h	Find the deflection under the concentrated lead for the beam shown in			
		find the deflection under the concentrated told for the beam shown in figure using conjugate beam method. EL-40000 KNLM ²	08	COD	LA
		ligule using conjugate bearn method. El= 40000 Kin-M	00	003	L4
		LOUR LIDEN			
		T			
		2 22			
		and the second s			
		Madala			
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	10	C04	L4
		E=200x10 ⁶ KN/m ² and cross sectional area of each bar as 150x10 ⁻⁶ m ²			
		1.0001.01			
		C LISOKN			
		50° 40° B			
		A			
		THE 3m 4"			
		(CS.)			
		OR			
8	а	Determine the deflection of the cantilever beam shown in figure at its free	08	co4	L4
		end, by castigilano's method. Take EI= 12000Nm²			
		mlan			
		francisco de la constancia de la constan			
	b	Determine the vertical and horizontal deflection at the end C of the bent	08	CO4	L4
		frame shown in figure by unit load method. Take E=200GPA and $I=6\times10^7$		-	-
		mm⁴			
		a stallm			
		B ABLET			
		<u>въргадо (С)</u>			
		r le			
		$\frac{1}{2}$			
		· · ·			
		Module 5			
Q		A three hinged parabolic arch has a span of $24m$ and a central rise of $4m$	16	CO5	L4
3		It carries a concentrated load of 75KN at 18m from the left support and	10		
		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.			

	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 1. the maximum and minimum tension in the cable 2. Length of the cable 3. the size of cable if the permissible stress of cable material is 200N/mm ²	16	c05	L4

2. SEE Important Questions

Cours	se:	Analysis of Determinate Structures Month	ith / Year May /		2020
Crs C	ode:	18cv42 Sem: IV Marks: 100 Time:		180 m	inutes
	Note	Answer all FIVE full questions. All questions carry equal marks.	-	-	
Mod ule	Qno.	Important Question	Marks	со	Year
1	1	Distinguish between Statically determinate beams and Indeterminate beams with examples.	e 08	CO1	L2
	2	Determine static and Kinematic indeterminacy of the following.	08	CO1	L4
		(1)			
	3	Find the forces in all members of the pin jointed truss shown in figure	06	CO1	L4
		A 100 60 60 00 A 100 3m 10 3m 100			
	4	Determine the nature and magnitude of forces of members FE, FD, CD by methods of sections for the truss shown in fig below	ý 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.	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	08	CO2	L4
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	1			1	
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 $F=200\times10^6$ KN/m ² and cross sectional area of each bar as 150×10^{-6} m ²	10	C03	L4
		IBOKN			
		C.X.			
		0 50° 40° B			
		3m 40			
		(53)			
		Determine the deflection of the contilevent became above in for we at its free			
	3	end, by castigilano's method. Take FI= 12000Nm ²	00	03	L4
		220/10			
		francisco			
		4 4 m 1			
	4	Determine the vertical and horizontal deflection at the end C of the bent	08	CO3	L4
		mm ⁴			
		a wolm			
		B ADD C			
		5W - D			
		E			
		i) A			
4	1	A three hinged parabolic arch has a span of 24m and a central rise of 4m.	16	CO4	L4
		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.			
	2	A cable is suspended between two points A and B 120m apart and a central dip of 8m. It carries a LIDL of 20KN/m. Determine	16	CO 4	
		1. the maximum and minimum tension in the cable	10	004	L4
		2. Length of the cable			
		3. the size of cable if the permissible stress of cable material is 200N/mm ²			
5	1	Define a Influence line diagram and mention its applications	07	COF	2
<u> </u>	2	Draw the influence line diagram formation	7	CO5	L4
		1. Reactions at supports of a simply supported beam.	08		
		2. Shear force of a simply supported beam carrying concentrated unit			

	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.	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.	15	CO5	L4
	13m 13m 12m 1 13m 13m 12m 1			

Course Outcome Computation

Academic Year:

Odd /	Even	semester
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INTERNAL TEST	T1					T2				Тз						
Course	CO		CO7		CO											
Outcome	1		2		3		4		5		6				8	
QUESTION	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV	Q3	LV	Q1	LV	Q2	LV
NO																
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 Weight of CO - PO	PO1	PO3	PO3	PO1	PO12	PO12	PO6	PO1
Course Outcome	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8
Test/Quiz/L		T1			T2		Т	3
ab QUESTION NO MAX MARKS USN-1	Q1	L Q2 LV V	Q3 LV	Q1 LV	Q2 LV	Q3 LV	Q1 LV	Q2 LV
USN-2								
USN-3								
USN-4								
USN-5 USN-6								
Average CO Attainment								