Ref No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY , BANGALORE-90

COURSE PLAN

Academic Year 2019-20

Program:	B E – Civil Engineering
Semester :	7
Course Code:	15CV741
Course Title:	Design of bridges
Credit / L-T-P:	3 / 3-0-0
Total Contact Hours:	40
Course Plan Author:	MOHAN K T

Academic Evaluation and Monitoring Cell

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Note : Remove “Table of Content” before including in CP Book
Each Course Plan shall be printed and made into a book with cover page
Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

A. COURSE INFORMATION

1. Course Overview

Degree:	Civil Engineering	Program:	B. E
Year / Semester :	4th/VII	Academic Year:	2019-20
Course Title:	Design of bridges	Course Code:	15cv741
Credit / L-T-P:	03	SEE Duration:	180 Minutes
Total Contact Hours:	40	SEE Marks:	80 Marks
CIA Marks:	20	Assignment	1 / Module
Course Plan Author:	Mohan K T	Sign	Dt:
Checked By:	SHIVAPRASAD D G	Sign	Dt:
CO Targets	CIA Target : 85 %	SEE Target:	90 %

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. Identify 2 concepts per module as in G.

Module	Content	Teaching Hours	Identified Module Concepts	Blooms Learning Levels
1	Introduction to bridges, classification, computation of discharge, linear waterway, economic span, afflux, scour depth. Design loads for bridges. Introduction to I.R.C. loading standards, Load Distribution Theory, Bridge slabs, Effective width, Introduction to methods as per I.R.C.	8 (4,4)	Preliminary Surveying of Bridges	L2 Understand
2	Design of Straight Slab Bridges and skew slab.	8 (4,4)	Bending moment , shear forces	L6 Design
3	Design of T beam bridges(up to three girder only) Proportioning of components, analysis of slab using IRC Class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load & IRC Class AA tracked vehicle, structural design of cross girder. Analysis of main girder using Courbon's method, calculation of dead load BM and SF, calculation of live load B M & S F using IRC Class AA Tracked vehicle. Structural design of main girder.	8 (4,4)	Bending moment and shear force for T-beam bridge. Courbon's method.	L6 Design
4	Design of Box culvert (Single vent only), Pipe culverts	8 (4,4)	Moments and shear force, load distribution.	L6 Design
5	Substructures – Design of Piers and abutments. Introduction to Bridge bearings, Hinges and Expansion joints.(No design)	8 (4,4)	Connections and laying of the bridges.	L6 Design
-	**Total**	**40**	-	-

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	Design of Bridges, D.JOHNSON VECTOR	1,2,3,4,5	In Dept
1, 2, 3, 4, 5	Design of Bridges, T R Jagadeesh, M A Jayaram	1,2,3,4,5	In Dept
B	**Reference books (Title, Authors, Edition, Publisher, Year.)**	**-**	**-**
1, 2	Design of Bridges, N. Krishna raju, CBS Publishers & Distributors, 2017.	1,2,3,4,5	In Dept
C	**Concept Videos or Simulation for Understanding**	**-**	**-**
C1	https://youtu.be/RB2k5hSYO3U https://youtu.be/5k8vdDSK6jU		
C2	https://youtu.be/U4a0q4hYUWw, https://youtu.be/rAH6eP1G4N0		
C3	https://youtu.be/TsjtbH7lSOE , https://youtu.be/RX-WImcb73Y		
C4	https://youtu.be/Llg1rYoZMfU, https://youtu.be/3UBrBrpW-uY,https://youtu.be/1t_tUmLUWcE https://youtu.be/7HXF3oGWRlA, https://youtu.be/BSBV2-f8z9Y.		
C5	https://youtu.be/TDuvNevZwp0 ,https://youtu.be/xh876dxfLnE https://youtu.be/BllNVVo2HnM https://youtu.be/KDXVQ3TMTlo		
C6	https://nptel.ac.in/courses/105105165/18		
C7	https://www.youtube.com/watch?v=ZifKweRcDoA		
C8	https://www.youtube.com/watch?v=ZifKweRcDoA		
C9	http://www.snehabearings.com/index1.html		
C10	https://youtu.be/WHS5a3LjrSE		
D	**Software Tools for Design**	**-**	**-**
	CSI Bridge, Sap, Staad. Pro.		
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						
3						
5						
-						
-						

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
1	Introduction and Classification	Higher education, GATE,		Understand L2
2	Design of Slabs	Higher education, GATE,		Design L6
3	Design of cross and Longitudinal Girders	Higher education, GATE,		Design L6
4	Design of pipe and Box culvert.	Higher education, GATE,		Design L6
5	Introduction to Bridge bearings, Design od Piers and Abutments.	Higher education, GATE,		Design L6
-				

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Modules	Course Code.#	Course Outcome **At the end of the course, student should be able to . . .**	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	15CV741.1	Understand the preliminary investigation on bridges.	4	Effects of water discharge on bridges	Lecture	Internal assessment and Assignment	L6 Evaluate
1	15CV741.2	Understand the type of load is suitable for design.	4	Loads applicable on the bridges	Lecture/ Tutorial	Internal assessment and Assignment	L6 Evaluate
2	15CV741.3	Design the Bending moment and shear force by using working stress method.	4	Straight slab	Lecture	Internal assessment and Assignment	L6 Evaluate
2	15CV741.4	Design the Bending moment and shear force by using working stress method.	4	Skew slab	Lecture	Internal assessment and Assignment	L6 Evaluate
3	15CV741.5	Design the Bending moment and shear force for longitudinal girder by using courbons method.	4	Longitudinal Girder	Lecture	Internal assessment and Assignment	L2 Evaluate
3	15CV741.6	Design the Bending moment and	4	Cross	Lecture/	Internal	L6

		shear force for transverse girder by using courbons method.		Girder	Tutorial	assessment and Assignment	Evaluate
4	15CV741.8	Design the Bending moment for box culvert by kanis method.	4	Box culvert	Lecture/ Tutorial	Internal assessment and Assignment	L2 Understand
4	15CV741.8	Design the loads and design for pipe culvert..	4	Pipe Culvert	Lecture/ Tutorial	Internal assessment and Assignment	L2 Understand
5	15CV741.9	Design the loads on the abutments and piers.	4	sizes of the structural components	Lecture	Internal assessment and Assignment	L2 Understand
5	15CV741.10	Understand the purpose of providing bearings.	4	Loads distribution on bridges.	Lecture	Internal assessment and Assignment	L2 Understand
-	**-**	**Total**	**40**	**-**	**-**	**-**	**L2-L6**

2. Course Applications

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

Modules	Application Area Compiled from Module Applications.	CO	Level
1	Used in the preliminary study in the bridges .	CO1	L2
1	Used for the design of roads and railway bridges.	CO2	L2
2	Used for the design of Reinforced cement concrete straight slab culvert.	CO3	L6
2	Used for the design of Reinforced cement concrete skew slab culvert.	CO4	L6
3	Used for the design of longitudinal girders.	CO5	L6
3	Used for the design of Transverse girders.	CO6	L6
4	Used for the design of Reinforced cement concrete box culvert.	CO7	L6
4	Used for the design of Reinforced cement concrete pipe culvert.	CO8	L6
5	Used for the design of piers and abutments.	CO9	L6
5	Used for the selection of bearing depending on type of bridges.	CO10	L2

3. Mapping And Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.
To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

Modules	Mapping		Mapping Level	Justification for each CO-PO pair	Level
-	**CO**	**PO**	**-**	**'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment'**	**-**
1	CO1	PO1	1	By applying the knowledge and finding the problem to manage projects and in multidisciplinary environments.	L2
1	CO1	PO2	3	Preliminary investigation Identify analyze complex engineering problems .	L2
1	CO1	PO3	1	Design/Development of solutions for investigated problems by applying complex engineering problems.	L2
1	CO1	PO11	2	By applying the knowledge and finding the problem to manage projects and in multidisciplinary environments.	L2
1	CO2	PO1	1	Apply the knowledge of civil engineering fundamentals to study the applied loads.	L2

1	CO2	PO2	1	`Should be able to identify the problems reaching using first principle of mathematics.	L2
1	CO2	PO3	1	Design solution for complex engineering problems ans design system components by consideration of public health and safety.	L2
1	CO2	PO11	3	By applying the engineering knowledge and problem analysis. It will be helpful to continue projects.	L2
2	CO3	PO1	1	Apply the knowledge of mathematics is applicable to Design bending moment and shear force.	L6
2	CO3	PO2	1	By applying Engineering knowledge and analyze complex bending moment and shear force in rc slab culvert.	L6
2	CO4	PO1	1	Knowledge of engineering fundamentals is required to understand behavior of RC slab culvert.	L6
2	CO4	PO2	1	Analyse complex engineering problems reaching substantiated to Bending moment and shear force.	L6
2	CO4	PO3	1	Design a RC slab culvert for the complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety	L6
2	CO4	PO11	3	By applying the knowledge of design of bridge in slab culverts, as a member and leader in a team, to manage projects and in multidisciplinary environments .	L6
3	CO5	PO1	1	Apply the knowledge of mathematics is applicable to Design bending moment and shear force in longitudinal girder.	L6
3	CO5	PO2	1	By applying Engineering knowledge and analyze complex bending moment and shear force in longitudinal girder..	L6
3	CO6	PO1	1	Knowledge of engineering fundamentals is required to understand behavior of Longitudinal girder.	L6
3	CO6	PO2	1	Analyse complex engineering problems reaching substantiated to Bending moment and shear force in longitudinal girder.	L6
3	CO6	PO3	1	Design a longitudinal and cross girder for the complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety	L6
3	CO6	PO11	3	By applying the knowledge of design of bridge on longitudinal and transverse girder as a member and leader in a team, to manage projects and in multidisciplinary environments .	L6
4	CO7	PO1	1	Knowledge of engineering fundamentals is required to understand behavior of Box Culvert..	L6
4	CO7	PO2	1	Analyse complex engineering problems reaching substantiated to Bending moment and shear force for box culvert by kani's method.	L6
4	CO7	PO3	1	Design a Box Culvert for the complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety	L6
4	CO7	PO11	3	By applying the knowledge of Box culverts as a member and leader in a team, to manage projects and in multidisciplinary environments .	L6
4	CO8	PO1	1	Knowledge of engineering fundamentals is required to understand behavior of Pipe culvert.	L6
4	CO8	PO2	1	Analyse complex engineering problems reaching substantiated to Bending moment and shear force in Pipe culvert.	L6
4	CO8	PO3	1	Design a Pipe culverts for the complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety.	L6
4	CO8	PO11	3	By applying the knowledge of design of pipe culverts as a member and leader in a team, to manage projects and in multidisciplinary environments .	L6
5	CO9	PO1	1	Apply the knowledge of mathematics is applicable to Design loads on piers and abutments.	L2

5	CO9	PO2	1	By applying Engineering knowledge and analyze complex loading conditions in design of pier and abutments.	L2
5	CO10	PO1	1	Knowledge of engineering fundamentals is required to understand behavior of Piers and abutments.	L6
5	CO10	PO2	1	Analyse complex engineering problems reaching substantiated to Bending moment and shear force in Piers and abutments.	L6
5	CO10	PO3	1	Design a Pier and abutment for the complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety	L6
5	CO10	PO11	3	By applying the knowledge of design of Piers and abutments as a member and leader in a team, to manage projects and in multidisciplinary environments .	L6

2.06	2.33	2.4	1.75	2	2	-	1	-	2	1	-	2.33

4. 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	PO8	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	Level
1	15CV741.1	Understand the preliminary investigation on bridges.	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L2
1	15CV741.2	Understand the type of load is suitable for design.	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L2
2	15CV741.3	Design the Bending moment and shear force by using working stress method.	2.06	-		-	-	-	-	-	-	-	-	-				L6
2	15CV741.4	Design RC slab culvert.	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L6
3	15CV741.5	Design the Bending moment and shear force for longitudinal girder by using courbons method.	2.06	2.33	-	-	-	-	-	-	-	-	-	-				L6
3	15CV741.6	Design the Bending moment and shear force for transverse girder by using courbons method.	2.06	2.33	-	-	-	-	-	-	-	-	-	-				L6
4	15CV741.8	Design the Bending moment for box culvert by kanis method.	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L6
4	15CV741.8	Design the loads and design for pipe culvert..	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L6
5	15CV741.9	Design the loads on the abutments and piers.	2.06	2.33	-	-	-	-	-	-	-	-	-	-				L6
5	15CV741.10	Understand the purpose of providing bearings.	2.06	2.33	2.4	-	-	-	-	-	-	-	-	2.33				L2
-	**15CV741PC**	**Average attainment (1, 2, or 3)**	**2.06**	**2.3**	**2.4**	-	-	**-**	-	-	-	-	**-**	2.33				**-**
-	*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; 8.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*																

5. 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					

2					
3					
4					
5					

6. Content Beyond Syllabus

Topics & contents required (from A.5) not addressed, but help students for Placement, GATE, Higher Education, Entrepreneurship, etc.

Modules	Gap Topic	Area	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1						
1						
2						
2						
3						
3						
4						
4						
5						
5						

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Modules	Title	Teach. Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Introduction to bridges	08	2	-	-	1	1	2	CO1, CO2	L2
2	Design of straight and skew slab	08	2	-	-	1	1	2	CO3, CO4	L6
3	Design of T-beam	08	-	2	-	1	1	2	CO5, CO6	L6
4	Design of box and pipe culvert.	08	-	2	-	1	1	2	CO7, C08	L6
5	Design of piers and abutments	08	-	-	4	1	1	2	CO9, CO10	L2,L6
-	**Total**	**40**	**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	15	CO1, CO2, CO3, CO4	L6
3, 4	CIA Exam – 2	15	CO5, CO6, CO8, C08	L6
5	CIA Exam – 3	15	CO9, CO10	L2
1, 2	Assignment - 1	05	CO1, CO2, CO3, CO4	L6
3, 4	Assignment - 2	05	CO5, CO6, CO8, CO8	L6
5	Assignment - 3	05	CO9, CO10	L2
1, 2	Seminar - 1			
3, 4	Seminar - 2			
5	Seminar - 3			
	Final CIA Marks	**20**	**-**	**-**

D1. TEACHING PLAN - 1

Module - 1

Title:	Introduction to bridges.	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Understand the preliminary investigation on bridges.	CO1	L2
2	Understand the type of load is suitable for design.	CO2	L2
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Introduction to bridges, classification,	CO1	L2
2	computation of discharge, linear waterway,.	C01	L2
3	economic span, afflux.	CO1	L2
4	scour depth.	CO1	L2
5	Design loads for bridges. Introduction to I.R.C. loading standards,	CO2	L2
6	Load Distribution Theory,	CO2	L2
7	Bridge slabs, Effective width,	CO2	L2
8	Introduction to methods as per I.R.C	CO2	L2
c	**Application Areas**	**CO**	**Level**
1	Used in the preliminary study in the bridges .	CO1	L2
2	Used for the design of roads and railway bridges.	CO2	L2
d	**Review Questions**	-	-
1	What is Bridge Engineering? Discuss how the bridges may be classified?	CO1	L2
2	Explain the components of bridge with neat sketch?	CO1	L2
3	Briefly explain linear waterway and economic span of bridge?	CO1	L2
4	Define afflux, scour, computation of discharge?	CO1	L2
6	Briefly explain the design loads for bridges?	CO2	L2
7	Explain load distribution theory in bridges?	CO2	L2
8	Introduction to methods as per IRC?	CO2	L2
e	**Experiences**	-	-
1			
2			
3			
4			
5			

Module – 2

Title:	Design of deck slab	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Design the Bending moment and shear force by using working stress method.	CO3	L2
2	Design the Bending moment and shear force by using working stress method.	CO4	L2
b	***Course Schedule***	-	-
Class No	**Module Content Covered**	**CO**	**Level**
1	Design of straight slab culvert?	CO3	L6
2	Problems	CO3	L6
3	Problems	CO3	L6
4	Problems	CO3	L6
5	Design of skew slab culvert?	CO4	L6

6	Problems	CO4	L6
7	Problems	CO4	L6
8	Problems	CO4	L6
c	**Application Areas**	**CO**	**Level**
1	Used for the design of Reinforced cement concrete straight slab culvert.	CO3	L2
2	Used for the design of Reinforced cement concrete skew slab culvert.	CO4	L2
d	**Review Questions**	-	-
1	Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm. Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m) Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	CO3	L2
2	Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	CO3	L2
3	Design a skew slab culvert for a national highway crossing of a stream to suit the following data. Clean span= 6m Width of bearing = 370mm. Width of carriage way=7.5m Overall depth of slab =540mm wearing coat=80mm skew angle=30°. Type of loading = IRC class AA tracked vehicle. Materials = M20 grade Concrete and Fe-415 HYSD bars.	CO3	L2
e	**Experiences**	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

E1. CIA EXAM – 1

a. Model Question Paper - 1

Crs Code:	15CV741	Sem:	VII	Marks:	15	Time:	75 minutes
Course:	Design of Bridges.						

-	-	**Note: Answer any 1 questions from each module, each carry equal marks.**	**CO**	**Level**	**Marks**
		Module-1			
1	a	What is Bridge Engineering? Discuss how the bridges may be classified?	CO1	L2	8
	b	Explain the components of bridge with neat sketch?	CO1	L2	7
		OR			
2	a	Briefly explain the design loads for bridges?	CO1	L2	7
	b	Briefly explain linear waterway and economic span of bridge?	CO1	L2	8
3		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m) Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	CO2	L6	15
		OR			

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15CV741	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes
Course:	Design of Bridges				Module : 1, 2		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1.		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
2		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
3		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
4		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
5		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
6		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
8		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
8		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
9		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
10		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
11		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
12		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
13		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
14		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
15		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
16		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
18		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
18		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
19		What is Bridge Engineering? Discuss how the bridges may be	5	CO1,	L2

		classified?		CO2	
20		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
21		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
22		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
23		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
24		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
25		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
26		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
28		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
28		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
29		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
30		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
31		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
32		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
33		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
34		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
35		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
36		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
38		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
38		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
39		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
40		Design a deck slab culvert for I R C Class A Loads.	5	CO1	L6

		Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?		,CO2	
41		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
42		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
43		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
44		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
45		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
46		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
48		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
48		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
49		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
50		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
51		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
52		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
53		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
54		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
55		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
56		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
58		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
58		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
59		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
60		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
61		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2

62		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2
63		Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
64		Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?	5	CO1, CO2	L6
65		What is Bridge Engineering? Discuss how the bridges may be classified?	5	CO1, CO2	L2
66		Explain the components of bridge with neat sketch?	5	CO1, CO2	L2

D2. TEACHING PLAN - 2

Module – 3

Title:	Design of T-beams	Appr Time:	8 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Design the Bending moment and shear force for longitudinal girder by using courbons method.	CO5	L2
2	Design the Bending moment and shear force for transverse girder by using courbons method.	CO6	L2
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Design of T beam bridges (up to three girder only) Proportioning of components,	CO5	L6
2	analysis of slab using IRC Class AA tracked vehicle, structural design of slab,	CO5	L6
3	analysis of cross girder for dead load & IRC Class AA tracked vehicle, structural design of cross girder.	CO5	L6
4	Problem.	CO5	L6
5	Analysis of main girder using Courbon's method, calculation of dead load BM and SF,	CO6	L6
6	Problem	CO6	L6
7	Calculation of live load B M & S F using IRC Class AA Tracked vehicle. Structural design of main girder.	CO6	L6
8	Problem	CO6	L6
c	**Application Areas**	**CO**	**Level**
1	Used for the design of longitudinal girders.	CO5	L2
2	Used for the design of Transverse girders.	CO6	L2
d	**Review Questions**	-	-
1	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	CO5	L6
2	Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	CO5	L6

3	Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	CO6	L6
4	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	CO6	L6
e	**Experiences**	-	-
1			
2			
3			
4			
5			

Module – 4

Title:	Design of culverts	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Design the Bending moment for box culvert by kanis method.	CO7	L6
2	Design the loads and design for pipe culvert..	CO8	L6
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Design of Box culvert (Single vent only),	CO7	L6
2	Problems	CO7	L6
3	Problems	CO7	L6
4	Problems	CO7	L6
5	Pipe culverts	CO8	L6
6	Problems	CO8	L6
7	Problems	CO8	L6
8	Problems	CO8	L6
c	**Application Areas**	**CO**	**Level**
1	Used for the design of Reinforced cement concrete box culvert.	CO7	L6
2	Used for the design of Reinforced cement concrete pipe culvert.	CO8	L6
d	**Review Questions**	-	-
1	Design a Box culvert having of side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30°, Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	CO7	L6
2	Design a Box culvert having of side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30°, Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	CO7	L6
3	Hydraulic design of pipe culvert?	CO8	L6
4	Culvert entrance structures, Structural design of pipe culvert?	CO8	L6
5	Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is	CO8	L6

	3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?		
6	Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?	CO8	L6
e	**Experiences**	-	-
1		CO7	L2
2			
3			
4		CO8	L3
5			

E2. CIA EXAM – 2

a. Model Question Paper - 2

Crs Code:	15CV741	Sem:	VII	Marks:	15	Time:	75 minutes		
Course:	Design Concept of Building Services								
-	**-**	**Note: Answer any 1 questions from each module, each carry equal marks.**					**Marks**	**CO**	**Level**
		Module-3							
1	a	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)					15	CO5	L2
	b	Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).					15	CO5	L2
		OR							
2	a	Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?					15	CO6	L2
	b	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).					15	CO6	L2
		Module-4							
1	a	Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?					15		
2	a	Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?					15		

		Hydraulic design of pipe culvert?	07		
		Culvert entrance structures, Structural design of pipe culvert?	07		

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15CV741	Sem:	VII	Marks:	5	Time:	90 – 120 minutes
Course:	Design of Bridges						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

SNo	USN	Assignment Description	Marks	CO	Level
1		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
2		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
3		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
4		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
5		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
6		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
7		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
8		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
9		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed	5	CO7,CO8	L6

		entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3, 3 edge bearing =72Kn/m?			
10		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3, 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
11		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
12		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
13		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
14		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
15		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
16		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
17		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
18		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
19		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3, 3 edge bearing =72Kn/m?	5	CO7,CO8	L6

20		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is $5m^3/s$. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
21		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
22		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
23		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
24		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
25		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
26		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
27		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
28		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
29		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is $5m^3/s$. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
30		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is	5	CO7,CO8	L6

		10m. The side slope of the embankment is 2:1. The maximum discharge is $5m^3/s$. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =$20Kn/m^3$, 3 edge bearing =72Kn/m?			
31		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
32		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
33		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
34		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
35		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of $14kN/m^2$ and LL of IRC Clause AA tracked vehicle, the unit weight of soil is $18kN/m^2$ and angle of repose of soil may be assumed as 30^0 , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
36		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of $14kN/m^2$ and LL of IRC Clause AA tracked vehicle, the unit weight of soil is $18kN/m^2$ and angle of repose of soil may be assumed as 30^0 , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
37		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
38		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
39		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is $5m^3/s$. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =$20Kn/m^3$, 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
40		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is $5m^3/s$. The safe velocity is 3m/s. Class AA tracked	5	CO7,CO8	L6

		vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?			
41		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
42		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
43		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
44		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
45		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
46		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
47		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
48		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
49		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 , 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
50		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil	5	CO7,CO8	L6

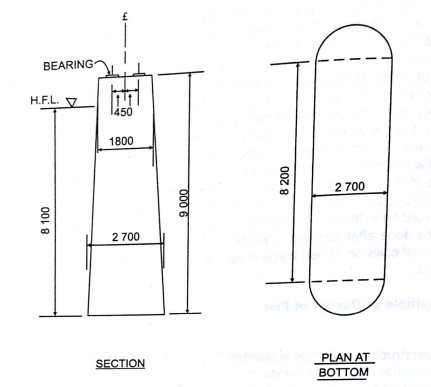
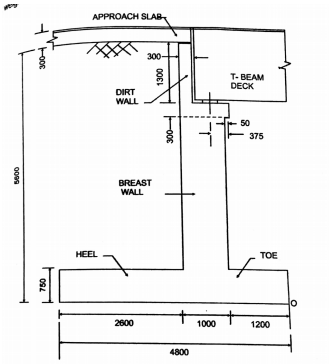
		=20Kn/m^3, 3 edge bearing =72Kn/m?			
51		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)	5	CO7,CO8	L6
52		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
53		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
54		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
55		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
56		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
57		Hydraulic design of pipe culvert?	5	CO7,CO8	L6
58		Culvert entrance structures, Structural design of pipe culvert?	5	CO7,CO8	L6
59		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3, 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
60		Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 2:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3, 3 edge bearing =72Kn/m?	5	CO7,CO8	L6
61		Design of Longitudinal girder of RCC T-Beam bridge of span	5	CO7,C	L6

		14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data)		O8	
62		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	5	CO7,CO8	L6
63		Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
64		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	5	CO7,CO8	L6
65		Design a Box culvert having 0f side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6
66		Design a Box culvert having 0f side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30° , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	5	CO7,CO8	L6

D3. TEACHING PLAN - 3

Module – 5

Title:	Engineering Services.	Appr Time:	08 Hrs
a	***Course Outcomes***	-	**Blooms**
-	The student should be able to:	-	**Level**
1	Design the loads on the abutments and piers.	CO9	L6
2	understand the purpose of providing bearings.	CO10	L2
b	***Course Schedule***		
Class No	**Module Content Covered**	**CO**	**Level**
1	Substructures – Design of Piers	CO9	L6
2	Problems	CO9	L6
3	abutments.	CO9	L6
4	Problems	CO9	L6
5	Problems	CO9	L6

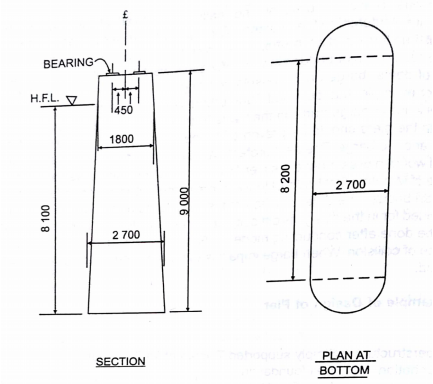
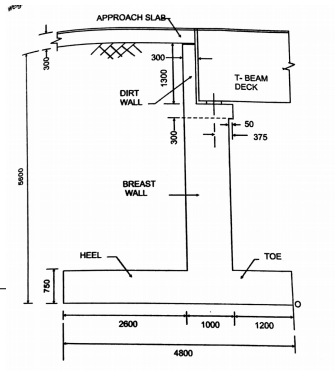
6	Problems	CO9	L6
7	Introduction to Bridge bearings,	CO10	L2
8	Hinges and Expansion joints.(No design)	CO10	L2
c	**Application Areas**	**CO**	**Level**
1	Used for the design of piers and abutments.	CO9	L6
2	Used for the selection of bearing depending on type of bridges.	CO10	L2
d	**Review Questions**	-	-
1	Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considered in design here. It is required to check the adequacy of the dimensions.	CO9	L6
2	Data Preliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m Types of abutment : Reinforced concrete. Loading : As for National Highway. Back fill : Given with angle of repose =35$^{o.}$ Unit weight of back fill, W= 18 Kn/m^3	CO9	L6
3	Mention the difference between the expansion bearings and fixed bearings?	CO10	L2
4	Write a note on pot bearing with neat sketch?	CO10	L2
5	What are the difference types of piers, wing walls and abutments with neat	CO10	L2

	sketches?		
6	What are the forces to be considered for the design of piers?	CO10	L2
7	List the types of bearings used for bridges and mention the functions of bearings?	CO10	L2
8	Explain rocker bearings and rocker and roller bearings with neat sketches?	CO10	L2
e	**Experiences**	-	-
1		CO9	L2
2			
3			
4		CO10	L2
5			

E3. CIA EXAM – 3

a. Model Question Paper - 3

Crs Code:	15cv741	Sem:	VII	Marks:	15	Time:	75 minutes
Course:	Design of Bridges						

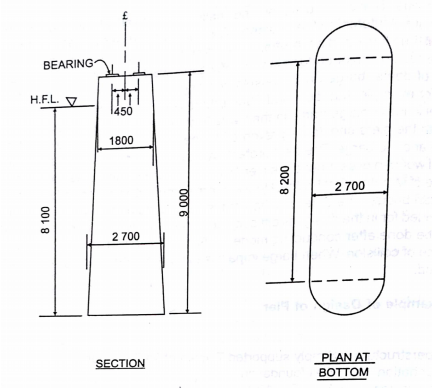
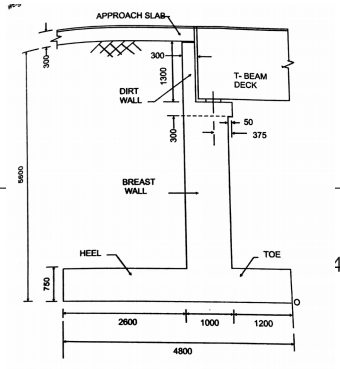
-	-	**Note: Answer any 1 questions from each module, each carry equal marks.**	**Marks**	**CO**	**Level**
		Module-5			
1	a	Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	15	CO9	L6
2	a	**OR**			
		Data Priliminary dimension : Shown in figure  	15	CO9	L6

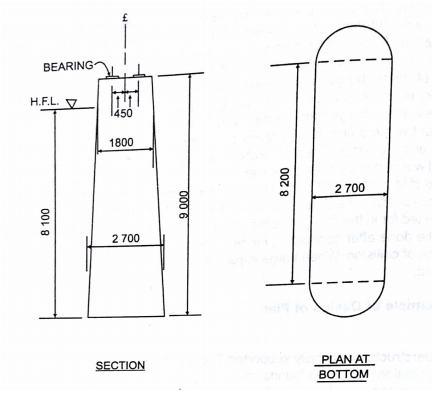
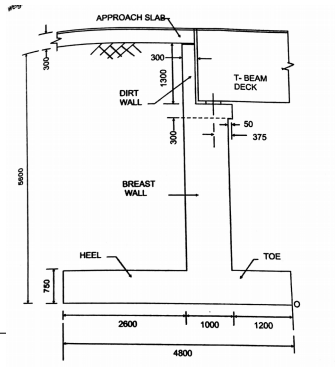
		Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m Types of abutment : Reinforced concrete. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3			
1	a	Mention the difference between the expansion bearings and fixed bearings?	08	CO10	L2
	b	Write a note on pot bearing with neat sketch?	07	CO10	L2
		What are the difference types of piers, wing walls and abutments with neat sketches?			
2	a	What are the forces to be considered for the design of piers?	05	CO10	L2
	b	List the types of bearings used for bridges and mention the functions of bearings?	10	CO10	L2

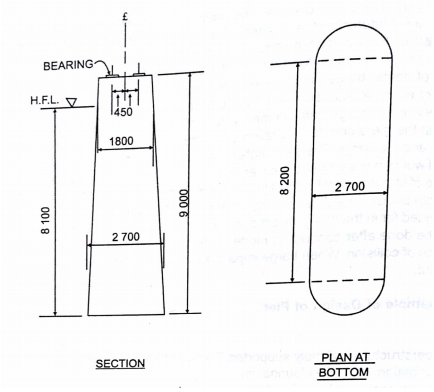
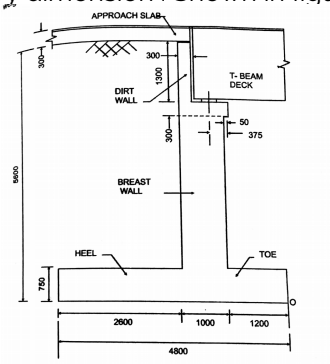
b. Assignment – 3

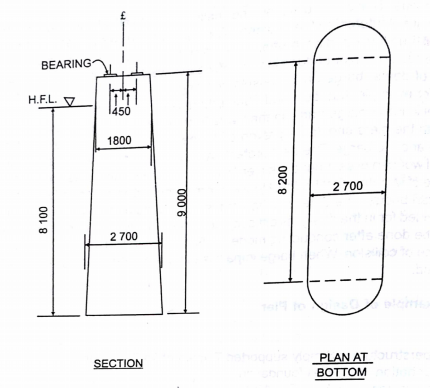
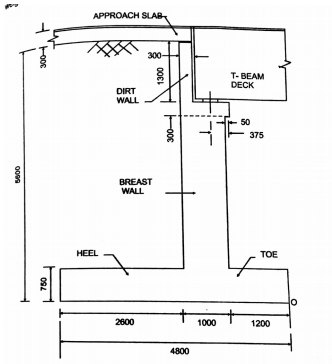
Note: A distinct assignment to be assigned to each student.

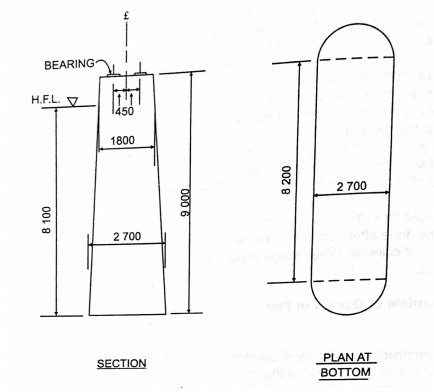
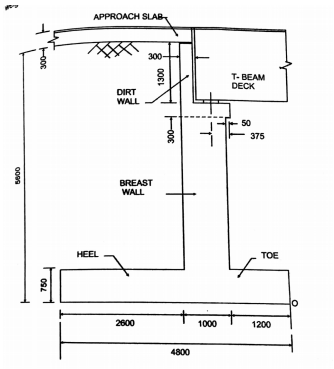
Model Assignment Questions							
Crs Code:	15CV741	Sem:	VIII	Marks:	5	Time:	90 – 120 minutes
Course:	Design of Bridges				Module : 5		
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							

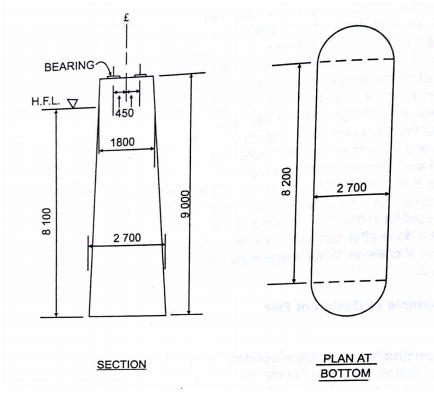
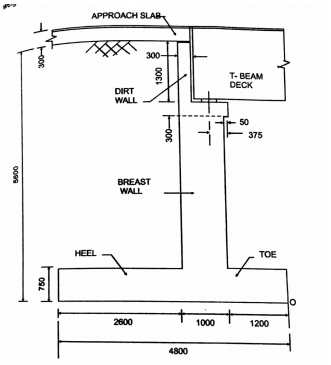
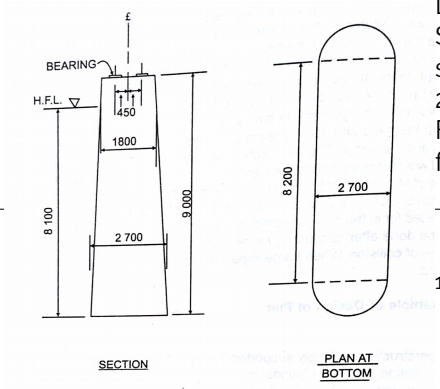
SNo	USN	Assignment Description	Marks	CO	Level
1		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	5	CO9	L2
2		Data Priliminary dimension : Shown in figure  	5	CO9	L2

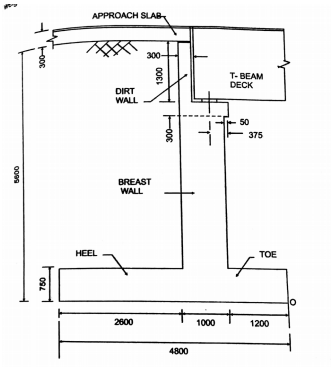
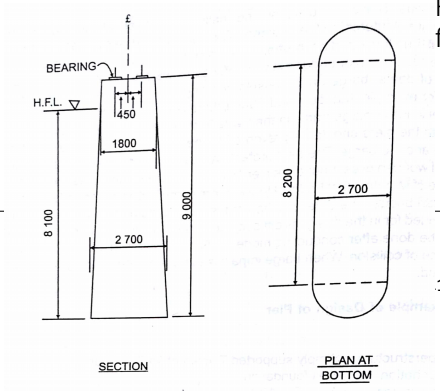
		Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35^{0}.. Unit weight of back fill, W= 18 Kn/m^{3}			
3		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
4		Write a note on pot bearing with neat sketch?	5	CO10	L2
5		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
6		What are the forces to be considered for the design of piers?	5	CO10	L2
8		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
8		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
9		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	5	CO9	L2
10		Data Priliminary dimension : Shown in figure  	5	CO9	L2

		Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3			
11		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
12		Write a note on pot bearing with neat sketch?	5	CO10	L2
13		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
14		What are the forces to be considered for the design of piers?	5	CO10	L2
15		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
16		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
18		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	5	CO9	L2
18		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3	5	CO9	L2

19		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
20		Write a note on pot bearing with neat sketch?	5	CO10	L2
21		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
22		What are the forces to be considered for the design of piers?	5	CO10	L2
23		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
24		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
25		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	5	CO9	L2
26		Data Priliminary dimension : Shown in figure  uperstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3	5	CO9	L2
28		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
28		Write a note on pot bearing with neat sketch?	5	CO10	L2
29		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
30		What are the forces to be considered for the design of piers?	5	CO10	L2
31		List the types of bearings used for bridges and mention the	5	CO10	L2

		functions of bearings?			
32		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
33		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	5	CO9	L2
34		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3	5	CO9	L2
35		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
36		Write a note on pot bearing with neat sketch?	5	CO10	L2
38		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
38		What are the forces to be considered for the design of piers?	5	CO10	L2
39		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
40		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
41		Data Superstructure: Simply supported T-beam of 21.3m span.	5	CO9	L2

		Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.			
42		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35^{0}. Unit weight of back fill, W= 18 Kn/m^{3}	5	CO9	L2
43		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
44		Write a note on pot bearing with neat sketch?	5	CO10	L2
45		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
46		What are the forces to be considered for the design of piers?	5	CO10	L2
48		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
48		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
49		 Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.	5	CO9	L2

		Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.			
50		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3	5	CO9	L2
51		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
52		Write a note on pot bearing with neat sketch?	5	CO10	L2
53		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
54		What are the forces to be considered for the design of piers?	5	CO10	L2
55		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
56		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
58		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  	5	CO9	L2

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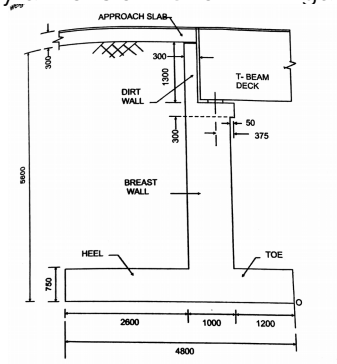
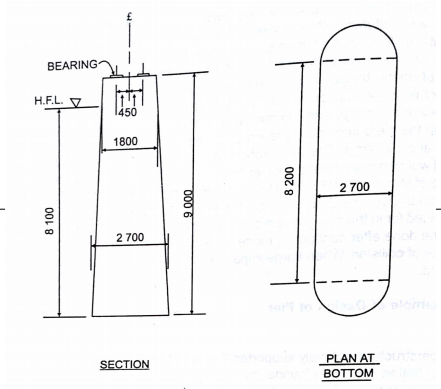
58		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35^{0}.. Unit weight of back fill, W= 18 Kn/m^{3}	5	CO9	L2
59		Mention the difference between the expansion bearings and fixed bearings?	5	CO10	L2
60		Write a note on pot bearing with neat sketch?	5	CO10	L2
61		What are the difference types of piers, wing walls and abutments with neat sketches?	5	CO10	L2
62		What are the forces to be considered for the design of piers?	5	CO10	L2
63		List the types of bearings used for bridges and mention the functions of bearings?	5	CO10	L2
64		Explain rocker bearings and rocker and roller bearings with neat sketches?	5	CO10	L2
65		Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation. 	5	CO9	L2

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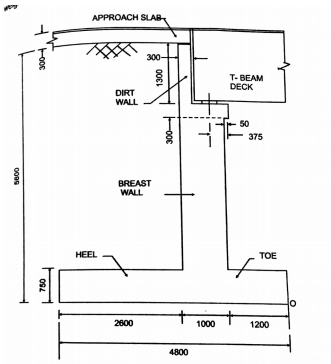
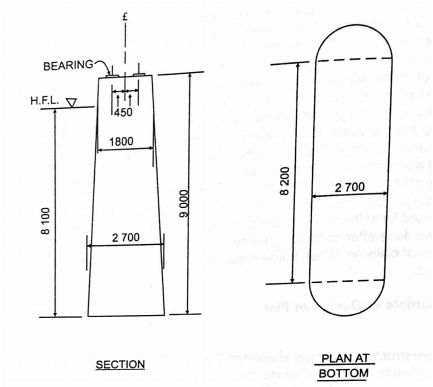
66		Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m. Types of abutment : Reinforced concrete.. Loading : As for National Highway. Back fill : Given with angle of repose =35°. Unit weight of back fill, W= 18 Kn/m^3	5	CO9	L2

F. EXAM PREPARATION

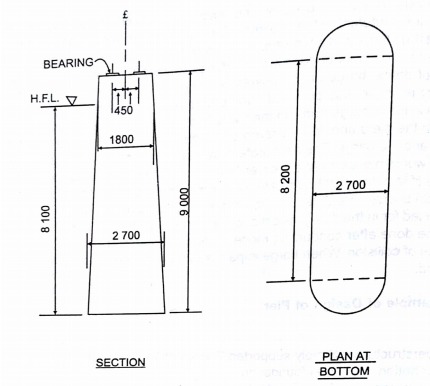
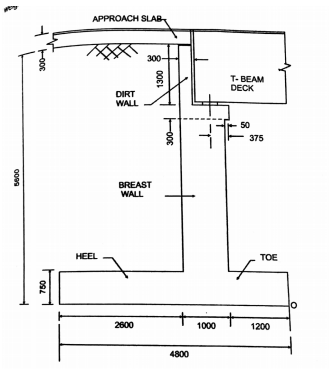
1. University Model Question Paper

Course:		Design of bridges						Month / Year		May /2018	
Crs Code:		15CV741	Sem:	VII	Marks:	80		Time:		180 minutes	
-	**Note**	Answer all FIVE full questions. All questions carry equal marks.							**Marks**	**CO**	**Level**
		Module-1									
1	a	What is Bridge Engineering? Discuss how the bridges may be classified?							8	CO1	L2
	b	Explain the components of bridge with neat sketch?							8	CO1	L2
		OR									
2	a	Briefly explain the design loads for bridges?							8	CO1	L2
	b	Briefly explain linear waterway and economic span of bridge?							8	CO1	L2
		Module-2									
3		Design a deck slab for the following particulars:.Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked), Road Two-lane (7.5m). Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?							16	CO2	L6
		OR									
4		Design a deck slab culvert for I R C Class A Loads.. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade							16	CO2	L6

		concrete and Fe 415 steel, Assume any missing data?			
		Module-3			
5		Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).	16	CO5	L6
		OR			
6		Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm, Slab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?	16	CO6	L6
		Module-4			
7	a	Design a Box culvert having of side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30^0 , Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	16	CO7	L6
8	a	Design a pipe culvert through a road embankment of height 6m. The width of the road is 7.5m and the formation width is 10m. The side slope of the embankment is 1.5:1. The maximum discharge is 5m^3/s. The safe velocity is 3m/s. Class AA tracked vehicle is to be considered as live load . Assume bell mouthed entry, Given C_e=1.5, C_s=0.010and the unit weight of the soil =20Kn/m^3 3 edge bearing =72Kn/m?	10	CO8	L6
	b	Hydraulic design of pipe culvert?	6	CO7	L2
		Module-5			
9	a	List the types of bearings used for bridges and mention the functions of bearings?	9	CO9	L2
	b	What are the difference types of piers, wing walls and abutments with neat sketches?	8	CO9	L2
		OR			
10	a	Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	16	CO10	L6

2. SEE Important Questions

Course:	Design of bridges					Month / Year	aug /2018	
Crs Code:	15CV741	Sem:	VII	Marks:	100	Time:	180 minutes	
	Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Qno.					**Marks**	**CO**	**Year**
1	1	What is Bridge Engineering? Discuss how the bridges may be classified?				9	CO1	
	2	Explain the components of bridge with neat sketch?				8	CO1	
	3	Briefly explain linear waterway and economic span of bridge?				8	CO1	
	4	Define afflux, scour, computation of discharge?				8	CO1	
	6	Briefly explain the design loads for bridges?				9	CO2	
	7	Explain load distribution theory in bridges?				9	CO2	
	8	Introduction to methods as per IRC?				8	CO2	
2	1	Design a deck slab for the following particulars: Clear span: 6m, Width of footpath: 1m on either side, Wearing coat: 80mm..Loading: I R C Class AA(tracked) , Road : Two-lane (7.5m).Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?				16	CO3	
	2	Design a deck slab culvert for I R C Class A Loads. Clear span: 5m, Width of bridge: 12m on either side, Wearing coat: 80mm. Materials: M25 grade concrete and Fe 415 steel, Assume any missing data?				16	CO3	
	3	Design a skew slab culvert for a national highway crossing of a stream to suit the following data. Clean span= 6m Width of bearing = 370mm. Width of carriage way=7.5m Overall depth of slab =540mm wearing coat=80mm skew angle=30°. Type of loading = IRC class AA tracked vehicle. Materials = M20 grade Concrete and Fe-415 HYSD bars.				16	CO3	
3	1	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).				16	CO5	
	2	Design a cross girder for the following data: Effective span=14m, Road width=7.5m, Thickness of Wearing coat=80mm,bSlab thickness=220mm, 3Longitudinal girder @ 3m c/c, cross girder @ 3.5m c/c, IRC class AA Tracked vehicle , Material M25 grade concrete, FE-415 grade steel, sketch the reinforcement Details?				16	CO5	
	3	Design of Longitudinal girder of RCC T-Beam bridge of span 16m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel Compute maximum bending moment and shear force due to dead load and live load?(Assume suitable missing data).				16	CO6	
	4	Design of Longitudinal girder of RCC T-Beam bridge of span 14m with 3 main girder @3 c/c, live load of IRC Class AA tracked vehicle is considered, Road width is 7.5m with foot path on both sides, wearing coat thickness=80mm, Use M25 grade concrete, FE-415 grade steel C ompute maximum bending moment and shear force due to dead load and live				16	CO6	

		load?(Assume suitable missing data).			
4	1	Design a Box culvert having of side dimension 3mX3m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30^o, Adopt M25 and FE415 in the design. The road is national highway and also sketch the reinforcement details of box?	16	CO7	
	2	Design a Box culvert having of side dimension 3mX2.5m and its subjected to DL of 14kN/m^2 and LL of IRC Clause AA tracked vehicle, the unit weight of soil is 18kN/m^2 and angle of repose of soil may be assumed as 30^o, Adopt M25 and FE500 in the design. The road is national highway and also sketch the reinforcement details of box?	16	CO7	
	3	Hydraulic design of pipe culvert?	07	CO8	
	4	Culvert entrance structures, Structural design of pipe culvert?	09	CO8	
5	1	Data Superstructure: Simply supported T-beam of 21.3m span. Foundation: Well foundation.  Dead load from each span = 2250kN Reaction due to live load on one span=900kN Maximum mean velocity of current =3.6m/sec Material for pier: Cement concrete M20 grade Live load: IRC Class AA or Class A whichever produces severer effect only the straight portion of the pier will be considerd in design here. It is required to check the adequacy of the dimensions.	15	CO9	
	2	Data Priliminary dimension : Shown in figure  Superstructure : T-beam two -lane bridge of effective span 16.1 m. Overall length = 17.26 m Types of abutment : Reinforced concrete. Loading : As for National Highway. Back fill : Given with angle of repose =35$^{o.}$ Unit weight of back fill, W= 18 Kn/m^3	15	CO9	
	3	Mention the difference between the expansion bearings and fixed bearings?	08	CO10	

	4	Write a note on pot bearing with neat sketch?	07	CO10	

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA -Design of Bridges

Module-#	Course Content or Syllabus (Split module content into 2 parts which have similar concepts)	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Introduction to bridges, classification, computation of discharge, linear waterway, economic span, afflux, scour depth. Design loads for bridges.	5	- L1 - L2	L2	Understand	Lecture/ PPT	Internal assessment and Assignment
1	Introduction to I.R.C. loading standards, Load Distribution Theory, Bridge slabs, Effective width, Introduction to methods as per I.R.C.	5	- L1 - L2	L2	Understand	Lecture/ PPT	Internal assessment and Assignment
2	Design of Straight Slab Bridges	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
2	Design of Skew Slab Bridges	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
3	Design of T beam bridges(up to three girder only) Proportioning of components, analysis of slab using IRC Class AA tracked vehicle, structural design of slab, analysis of cross girder for dead load & IRC Class AA tracked vehicle, structural design of cross girder.	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
3	Analysis of main girder using Courbon's method, calculation of dead load BM and SF, calculation of live load B M & S F using IRC Class AA Tracked vehicle. Structural design of main girder.	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
4	Design of Box culvert	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
4	Design of Pipe culvert	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
5	Substructures – Design of Piers and abutments.	5	- L6 - L6	L6	Design	Lecture	Internal assessment and Assignment
5	Introduction to Bridge bearings, Hinges and Expansion joints.(No design)	5	-L1 -L2	L2	Understand	Lecture	Internal assessment and Assignment

2. Concepts and Outcomes:

Table 2: Concept to Outcome – Design of Bridges

Module-#	Learning or Outcome from study of the Content or Syllabus	Identified Concepts from Content	Final Concept	Concept Justification (What all Learning Happened from the study of Content / Syllabus. A short word for learning or outcome)	CO Components (1.Action Verb, 2.Knowledge, 3.Condition / Methodology, 4.Benchmark)	Course Outcome **Student Should be able to ...**
A	*I*	*J*	*K*	*L*	*M*	*N*
1		Effects of water discharge on bridges	Water discharge on bridges	Water Properties.	- Understand - Bridges.. - -	Understand the preliminary investigation on bridges.
1	Understand the preliminary investigation on bridges.	Loads applicable on the bridges		Load on bridges.	- Understand - IRC Codes. - -	Understand the type of load is suitable for design.
2	Understand the type of load is suitable for design.	finding bending moment and shear forces	Bending moment , shear forces	Straight slab .	- Design - Mathematical - Working stress method.	Design the Bending moment and shear force by using working stress method.
2	Design the Bending moment and shear force by using working stress method.	finding bending moment and shear forces		Skew slab.	- Design - Mathematical - Working stress method.	Design the Bending moment and shear force by using working stress method.
3	Design the Bending moment and shear force by using working stress method.	Bending moment and shear force for T-beam bridge.	Bending moment and shear force for T-beam bridge. Courbon's method.	Longitudinal girders.	- Design - Mathematical - Working stress method.	Design the Bending moment and shear force for longitudinal girder by using courbons method.
3	Design the Bending moment and shear force for longitudinal girder by using courbons method.	Courbon's method of finding bending moment and shear force.		Cross girders.	- Design - Mathematical - Working stress method. -	Design the Bending moment and shear force for transverse girder by using courbons method.
4	Design the Bending moment and shear force for transverse girder by using courbons	Moments and shear force, load distribution.	Moments and shear force, load distribution.	Box Culverts	- Design - Mathematical - Working stress method. -	Design the Bending moment for box culvert by kanis method.

	method.					
4	Design the Bending moment for box culvert by kanis method.	Pipe Culvert		Pipe Culverts.	- Design - Mathematical - Working stress method.	Design the loads and design for pipe culvert..
5	Design the loads and design for pipe culvert..	Sizes of the structural components	Connections and laying of the bridges.	Piers and Abutments.	- Design -Mathematical - Working stress method.	Design the loads on the abutments and piers.
5	Design the loads on the abutments and piers.	Bearings.		Bearings.	- Understand - Bearings.	Understand the purpose of providing bearings.
	Understand the purpose of providing bearings.					