CE604PC: STRUCTURAL ENGINEERING – II (STEEL)

COURSE PLANNER

I. COURSEOVERVIEW:

This course is recommended for undergraduate students of Civil engineering program who are interestedinlearningthedesignofsteelstructures.Theobjectivesofthisareto learnthebehavior and design of structural steel. The course is structured to introduce inelastic analysis of steel structures,issues of strength and stability and its application to design for case of extreme loading, and related code provisions. The objective of the course is to make the student conversant with the design principles of steel structural elements as per IS Codal provisions

II. PREREQUISITE(S):

Level	Credits	Periods	Prerequisite
UG	4	5	Structural Analysis I& II

III. COURSEOUTCOMES:

At the end of this course, a student will be able to:

COURSE OUTCOMES	Description	Blooms Taxonomy Levels	PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES
C01	Analyze the tension members, compression members.	Understand	PO1,PO2,PO3, PSO 1
C02	Design the tension members, compression members and column bases and joints and connections	Understand	PO1,PO2,PO3, PO5, PSO 1
C03	Analyze and Design the beams including built-up sections and beam and connections.	Design	PO1,PO2,PO3, PO5, PSO 2
C04	Identify and Design the various components of welded plate girder including stiffeners	Design	PO1,PO2,PO3, PO5, PSO 1, PSO 2

IV. HOW PROGRAM OUTCOMES AREASSESSED:

Program outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: To Apply the knowledge of mathematics, science, engineeringfundamentals/principals,	0.4	Assignments
	and civil engineering to the solution of complex engineering problems encountered in modern engineering practice.		
PO2	**Problem analysis**: Ability to Identify, formulate, review research literature, and analyze complexengineering problems related to Civil Engineering andreaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	1.2	Exercise, Exams
PO3	**Design/development of solutions**: Design solutions for complex engineering problems related to Civil Engineering anddesign system components or processes that meet the specifiedneedswithappropriateconsiderationforthepublic health and safety, and the cultural, societal,and environmental considerations.	0.4	Exercise
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and researchmethods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	-	Discussion, Seminars
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modernengineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	1.2	Discussion, Seminars
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the Civil Engineering professional engineering practice.	-	Discussions
PO7	**Environmentandsustainability**:Understandtheimpactof the Civil Engineeringprofessional engineering solutionsin societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment.	-	------
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms ofthe engineering practice.	-	------
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader indiverse teams, and in multidisciplinary settings.	-	------

PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and withsocietyatlarge,suchas,beingabletocomprehendand write effective reports and design documentation,make effective presentations, and give and receive clear instructions.	-	------
PO11	**Project management and finance**: Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work,	-	-----
	as a member and leader in a team, to manage projects and in multidisciplinary environments.		
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.	-	Prototype, Discussions

V. HOW PROGRAM SPECIFIC OUTCOMES AREASSESSED:

Program outcomes		Level	Proficiency assessed by
PSO 1	**ENGINEERINGKNOWLEDGE:**Graduateswillbeabletoapply technical knowledge in drawing, analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good basics inmathematics, basic sciences and technical communication.	1.2	Lectures and Assignments
PSO 2	**BROADNESS AND DIVERSITY:**Graduates will be able to summarize and can demonstrate about societal, economical, environmental, health and safety factors involved in infrastructural development, and shall work within multidisciplinary teams with competence in modern tool usage.	-	Tutorials
PSO 3	**SELF-LEARNING AND SERVICE:**Graduates will be able to pursue lifelong learning and professional development to face the challenging and emerging needs of our society, ethically and responsibly.	-	Seminars and Projects

1-None **2 -Supportive** **3 – Highly Related**

VI. SYLLABUS:

UNIT – I:

Materials – Types of structural steel – Mechanical properties of steel – Concepts of plasticity – yield strength - Loads and Stresses – Local buckling behavior of steel. Concepts of limit State Design Different Limit States – Load combinations for different Limit states - Design Strengths - deflection limits – serviceability – stability check.

Design of Connections– Different types of connections – Bolted connections – Design strength –

efficiency of joint– prying action - Welded connections – Types of welded joints – Design requirements - Design of Beam-column connections - Eccentric connections - Type I and Type II connection – Framed connection– stiffened / seated connection.

UNIT – II:

Design of tension Members – Design strength – Design procedure splice – lug angle.Design of compressinmembers-Bucklingclass-slendernessratio/strengthdesign-laced-battenedcolumns-splice- column base- slabbase.

UNIT – III:

Plastic Analysis;Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Laterally supported and unsupported Beams – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beamsplice
Plastic Analysis;Plastic moment – Plastic section modulus - Plastic analysis of continuous beams Design of Flexural Members – Laterally supported and unsupported Beams – Design of laterally supported beams - Bending and shear strength/buckling – Built-up sections - Beamsplice

UNIT-IV:

Design of welded plate girders – elements – economical depth – design of main section – connections between web and flange – design of stiffeners - bearing stiffener– intermediate stiffeners – Design of web splice and flange splice.

UNIT-V:

Design of Industrial Structures; Types of roof trusses - loads on trusses – wind loads - Purlin design – truss design – Design of welded Gantry girder

SUGGESTED BOOKS:

TEXT BOOKS:

1. Steel Structures by Subramanyam.N, Oxford Higher Education, NewDelhi.
2. Limit State Design of steel structures by S.K. Duggal, Tata McGraw-Hill, NewDelhi.

REFERENCE BOOKS:

1. Design of steel structures by k.s.Sai ram ,person education
2. Design of Steel Structures by Edwin Gaylord,Charles Gaylord,James Stallmeyer, Tata Mc.Graw-Hill, NewDelhi.
3. Design of steel structures vol.1&2-ram Chandra,standard publications
4. Design of steel structure,structures,.s.s bhavikatti,ik int publications house,newdelhi,2010

MOOC'S- SWAYAM/ NPTEL:
https://nptel.ac.in/courses/105106112/

https://nptel.ac.in/courses/105106112/

GATE SYLLABUS:

Working stress and Limit state design concepts; Design of tension and compression members, beams and beam- columns, column bases; Connections - simple and eccentric, beam-column connections, plate girders and trusses; Plastic analysis of beams and frames.

IES SYLLABUS:

Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column

connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

VII. COURSE PLAN:

Lecture No.	Unit No.	Topics to be covered	Link for PPT	Link for PDF	Course learning outcomes	Teaching Methodology	Reference
1	**1**	**UNIT-I** Introduction to Steel, Materials - types of structural steel	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	To understand: Introduction to Materials	Digital writing pad, PPT, Chalk and talk	**T1, T2, T3**
2		Concept of Plasticity, Yield Strength	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	To learn: Concepts of plasticity	Digital writing pad, PPT, Chalk and talk	
3		Concept of Limit State Design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Code for Steel Structures	Digital writing pad, PPT, Chalk and talk	
4		Limit States – Design Strengths	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	To learn: Concepts of limit state design	Digital writing pad, PPT, Chalk and talk	
5		Deflection Limits	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg	https://drive.google.com/drive/folders/1Vpj72MXm0-	Deflection Limits	Digital writing pad, PPT,	

			5NIPiFshGkVsvb4X	oUAmo_FXgxYPn38-jbz7Vo		Chalk and talk	
6		Serviceability – serviceability – stability check	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** serviceability	Digital writing pad, PPT, Chalk and talk	
8		Design of connections, different types of connections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Design of Connections	Digital writing pad, PPT, Chalk and talk	
9		Design of connections, different types of connections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Design of Connections	Digital writing pad, PPT, Chalk and talk	
10		Bolted connections- Design strength	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Design strength	Digital writing pad, PPT, Chalk and talk	
11		Efficiency of a joint, Prying Action	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Efficiency of a joint	Digital writing pad	
12		Types of Welded connections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To learn:** Welded connections	Digital writing pad	
13		Types of Welded joints- Specifications, Design requirements	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To learn:** Welded connections	Digital writing pad, PPT, Chalk and talk	
14		Design of beam-column connections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To learn:** Welded connections	Digital writing pad, PPT, Chalk and talk	
16		Eccentric connections- Type I & II connection	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To understand:** Design of Welds	Digital writing pad, PPT, Chalk and talk	

17		Framed connection- Stiffened/ seated connection	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To learn:** Tension Members	Digital writing pad, PPT, Chalk and talk	
18		Framed connection- Stiffened/ seated connection	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1Vpj72MXm0-oUAmo_FXgxYPn38-jbz7Vo	**To learn:** Tension Members	Digital writing pad, PPT, Chalk and talk	
19		**UNIT-II**Design of tension Members	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** Design strength, Design	Digital writing pad, PPT, Chalk and talk	
20		Simple & built up members - design strength	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To learn:** procedure, splice lug- angle.	Digital writing pad, PPT, Chalk and talk	
21		Built up members -design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To learn:** procedure	Digital writing pad, PPT, Chalk and talk	**T1, T2, T3**
22	**2**	Design procedure splice – lug angle	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** Problem related to tension members	Digital writing pad, PPT, Chalk and talk	
24		Design of compression members	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** Introduction to compression members	Digital writing pad, PPT, Chalk and talk	
25		Buckling class, slenderness ratio/ strength design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To learn:** Buckling class	Digital writing pad, PPT, Chalk and talk	**T1, T2, T3**
26		Design of simple compression members- procedure	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** Introduction to compression members	Digital writing pad, PPT, Chalk and talk	

27		Design of simple compression members- procedure	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** Introduction to compression members	Digital writing pad, PPT, Chalk and talk	
28		Design of simple compression members: laced- battened columns	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To understand:** battened column	Digital writing pad, PPT, Chalk and talk	
29		Design of simple compression members: splice- column base- slab base.	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1GBTs2K6D10wLU-DdkE4wr9dRtbzzP35e	**To learn:** To know Splice column base slab base	Digital writing pad, PPT, Chalk and talk	
30		**UNIT-III :** Introduction to plastic analysis, plastic moment	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To understand:** To know Plastic Theory and plastic hinge	Digital writing pad, PPT, Chalk and talk	
31		plastic section modulus, Plastic analysis of continuous beams	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To understand:** To know Plastic Theory and plastic hinge	Digital writing pad, PPT, Chalk and talk	
32		Theorems of plastic Analysis	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To learn:** To know plastic Analysis	Digital writing pad, PPT, Chalk and talk	
33		Theorems of plastic Analysis	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To learn:** To know plastic Analysis	Digital writing pad, PPT, Chalk and talk	
34		Plastic analysis of continuous beams	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To learn:** To know plastic Analysis	Digital writing pad, PPT, Chalk and talk	
36		Laterally supported/ unsupported beams	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To understand:** To know Bending and Shear Strength / buckling	Digital writing pad, PPT, Chalk and talk	

37		Laterally supported/ unsupported beams	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To understand:** To know Bending and Shear Strength / buckling	Digital writing pad, PPT, Chalk and talk	
38		Design of laterally supported beams- Problems	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** Laterally supported beams	Digital writing pad, PPT, Chalk and talk	
39		Design of laterally supported beams- Problems	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** Laterally supported beams	Digital writing pad, PPT, Chalk and talk	
40		Bending and shear strength/buckling	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To understand:** Bending and shear strength of beams	Digital writing pad, PPT, Chalk and talk	
41		Design of built up sections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** built-up sections	Digital writing pad, PPT, Chalk and talk	
42		Design of built up sections	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X-	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** built-up sections	Digital writing pad	
43		Design of beam splice	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X-	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** beam splice	Digital writing pad	
45		Design of beam splice	- https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X-	https://drive.google.com/drive/folders/18jJi84vlsj_wtNgd8BN102Syaf5_xxRK	**To design:** beam splice	Digital writing pad	
46		**UNIT-IV**Design of welded plate girders	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4HrI_MeH	**To understand:** Introduction to plate girders,	Digital writing pad, PPT, Chalk and talk	

47		Design of welded plate girders	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	Introduction to plate girders,	Digital writing pad	
48		Elements-economical depth	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X -	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To understand:** economical depth,	Digital writing pad	
49		Design of main section	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X -	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To learn:** design of main section.	Digital writing pad	
50		Connections between web and flange	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To understand:** Connections between web flange,	Digital writing pad	**T1, T2, T3**
51		Design of bearing stiffeners	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To design**: stiffners bearing,	Digital writing pad	
52	**4**	Design of intermediate stiffeners	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To design:** intermediate stiffeners	Digital writing pad	
53		Design of intermediate stiffeners	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To design:** intermediate stiffeners	Digital writing pad	
55		Design of web splice	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To understand:** Design of Plate girder using IS 800:2007 Problems related.	Digital writing pad	
56		Design of web splice problems	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4Hrl_MeH	**To learn:** Design of Plate girder using IS 800:2007 Problems related.	Digital writing pad	**T1, T2, T3**
57		Design of Flange splice	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsv	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4	**To learn:** Design of Flange splice	Digital writing pad	

			b4X	HrI_MeH		
58		Design of Flange splice	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1NzqmY4Xg27qFNXpw_KAZLDZD4HrI_MeH	**To learn:** Design of Flange splice	Digital writing pad
59	**5**	**UNIT-V**DESIGN INDUSTRIAL STRUCTURES, Types of roof trusses	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To understand**: Roof trusses	Digital writing pad
60		loads on trusses, wind loads	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To understand:** Wind loads	Digital writing pad
61		Design of purlin	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To learn:** Analysis of trusses, design of members,	Digital writing pad
62		Design of purlin	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To learn:** Analysis of trusses, design of members,	Digital writing pad
63		Design of purlin	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To learn:** Analysis of trusses, design of members,	Digital writing pad
63		**PRESENTATION BY STUDENTS**				
64		Design of purlin	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To learn:** Analysis of trusses, design of members,	Digital writing pad
65		Design of purlin	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To learn:** Analysis of trusses, design of members,	Digital writing pad
66		Truss design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsv	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82O	**To design**: Truss	Digital writing pad

			b4X	wpgkEs		
67		Truss design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design**: Truss	Digital writing pad
68		Truss design	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design**: Truss	Digital writing pad
69		Design of welded Gantry girder	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design:** welded gantry girder	Digital writing pad
70		Design of welded Gantry girder	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design:** welded gantry girder	Digital writing pad
71		Design of welded Gantry girder	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design:** welded gantry girder	Digital writing pad
72		Design of welded Gantry girder	https://drive.google.com/drive/folders/1LftKpdFwm4beJczg5NIPiFshGkVsvb4X	https://drive.google.com/drive/folders/1n4f9E2qsraGG2EGH8dcC77G82OwpgkEs	**To design:** welded gantry girder	Digital writing pad

VIII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFICOUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
I	2	3	-		-	-	-	-	-	-	-	-	3	-	-
II	-	-	-			-		-	-	-	-	-	-	-	-
III	-	3	-	--	3	-	-	-	-	-	-	-	3	-	-
IV	-	-	-			-	-	-	-	-	-	-	-	-	-
V	-	-	2		3	-	-	-	-		-	-	-	-	-
average	0.4	1.2	0.4	-	1.2	-	-	-	-	-	-	-	1.2	-	-

1=None **2=Supportive** **3=Highlyrelated**

IX. QUESTION BANK: DESCRIPTIVE QUESTIONS: (WITH BLOOMSPHRASES)

UNIT-I

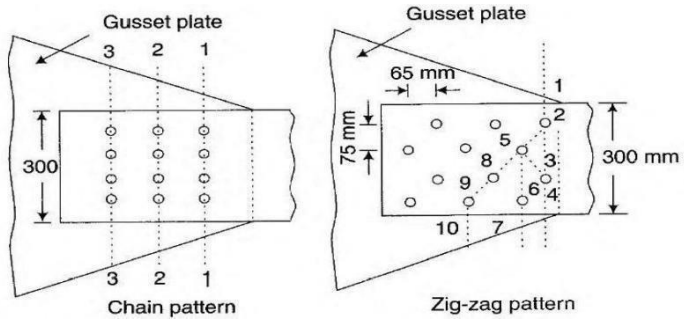
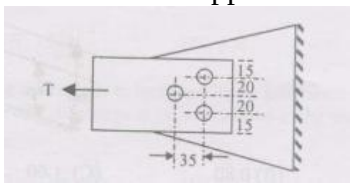
SHORT ANSWER QUESTIONS-

S.NO	Question	Blooms Taxonomy Level	Programme Out come
1.	What are the advantages and disadvantages of steel as a structural material?	Understand	1
2.	State the physical and mechanical properties of steel as a structural material.	Remember	1
3.	How the standards and specifications are different from codes?	Understand	1
4.	Why is it necessary to follow codes of practice for designing structures?	Understand	1
5.	Find the shape factors for a Square of side ‘a’ with its diagonal parallel to the zz- axis.	Understand	1
6.	Sketch the typical stress-strain curve of steel, indicating the important regions.	Remember	2
7.	What is meant by ductility? Why and where is it important?	Understand	2
8.	How the toughness of steel is measured?	Remember	2
9.	How are residual stress induced in steel sections? Sketch the typical residual stress distribution in a rolled I beam and a welded I beam.	Understand	2

10.	How do residual stresses affect design of intermediate columns and beams?	Understand	2

LONG ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	How the local buckling of steel structural shapes does affect the member strength? How is it avoided?	Understand	1
2.	What are the defects that may originate while rolling steel section?	Remember	1
3.	Strength and ductility of steel are equally important for steel structures. How are these improved? If the strength is to be increased while retaining the desired ductility of steel. What is done?	Understand	2
4.	Draw idealised stress-strain curve for mild-steel. Discuss the effect of residual stresses.	Remember	2
5.	A specimen was tested in laboratory and the yield strength was found to be 250 N/mm^2. Taking a factor of safety of 2. Find the working stress.	Understand	1
6.	A 100 mm long steel bar and having a square cross section of 20 mm is pulled in tension with a load of 90 kN. It experiences an elongation of 0.10 mm. Assuring that the deformation is entirely elastic, determine the modulus of elasticity of the steel.	Understand	1
7.	Hot-rolled steel sections are used to fabricate steel sections. Under no load Condition whether the section will have stresses? Comment!	Understand	2
8.	An ISA 65 x 65 x 10 carries a tensile load of 200 KN, applied along its centroidal axis. This angle is to be welded to a gusset plate. Find out the Lengths of side fillet welds required at the heel and toe of the angle	Understand	3

9.	A 300 ISF 14 mm of grade Fe410 is used as a tension member in a lattice girder. It is connected to a 18 mm thick gusset plate by 18 mm diameter bolts of grade 4.6 Calculate the effective net area of the member, if (a) chain bolting is done as showninFigure1. (b) zig-zag bolting is done as showninFigure1.  	Understand	3
10.	A steel flat of rectangular section of size 70 × 6 mm is connected to a gusset plate by three bolts each having a shear capacity of 15 kN in holes having diameter 11.5 mm.Iftheallowabletensilestressintheflatis150MPa, Find the maximum tension that can be applied to theflatis  	Understand	3

UNIT-2

SHORT ANSWER QUESTIONS-

S.N	Question	Blooms Taxonomy Level	Programme Out come
1.	What is buckling?	Remember	4
2.	Two steel columns P (length L and yield strength f_y=250 MP_a) and Q (length 2L and yield strength f_y=500 MP_a) have the same cross-sectionsand end-conditions. Find the ratio of buckling load of column P to thatof column Q.	Understand	4
3.	What is radius of gyration?	Remember	4
4.	What is slenderness ratio? State the relation between elastic critical stress and slenderness ratio.	Remember	4

5.	Compression members are more critical than tension members. Comment!	Understand	4
6.	Why are plastic or compact sections preferred for compression members?	Understand	4
7.	What is the difference in behaviour of long and intermediate columns?	Understand	4
8.	Which of the two, buckling or stiffness of compression members is more critical?	Remember	4
9.	Why are four different buckling curves prescribed to Understand column strength?	Understand	4
10.	How does strain hardening affect the strength of short columns?	Understand	4

LONG ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	Why a separate provision (formula) for the design of a single angle strut has been proposed by IS: 800 code?	Understand	5
2.	Cite the instances when a column may be regarded as an axially loaded column?	Remember	4
3.	What is the basic difference in behaviour between tension and compression members, while resisting the loads?	Understand	4
4.	How does the behavior of a compression member differ based on its length?	Understand	4
5.	Why is it better to choose plastic or compact sections for columns?	Understand	2
6.	Derive the Euler's formula.	Understand	4
7.	Calculate the design strength of W14 x 74 with length of 20 ft. and pinned ends. A36 steel is used.	Understand	4
8.	A strut of 3.4 m length in a truss is connected at each of its ends with welding to the gusset plate. The strut is of a section ISA 100 x 100 x 10 mm.	Understand	4
	Determine its equivalent slenderness ratio.		
9.	Design a column of I-section to support a factored load of 1050 kN. The column has an effective length of 7.0 m with respect to z-axis and 5.0 m with respect to y-axis. Use steel of grade Fe 410.	Understand	4
10.	(a) Design a built up column composed of two channel sections placed back to back, carrying an axial load of 1500 kN. The effective length of column is 7 m (b) Also design a single lacingsystem.	Understand	4

UNIT-3

SHORT ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	What are rolled I-sections widely used as beam members?	Remember	4
2.	Differentiate between the bending and buckling of a beam.	Understand	4
3.	How does buckling of column and beam differ?	Remember	4
4.	Why should plastic or compact section be preferred for flexural members in limit state design method?	Understand	4
5.	What are checks to be performed for beam member design?	Understand	4
6.	What is the difference between bending and buckling of a beam member?	Remember	4
7.	What is meant by lateral torsional buckling of beam member?	Understand	4
8.	Under what conditions can lateral buckling occur?	Understand	4
9.	Under what conditions can a beam member be assumed as laterally restrained?	Remember	4
10.	What is local buckling of a beam member	Remember	4

LONG ANSWER QUESTIONS-

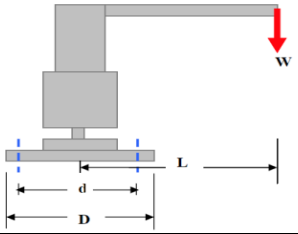
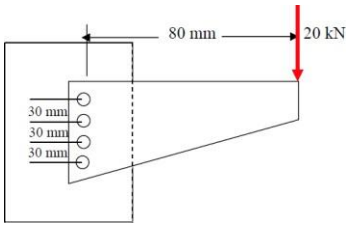
S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	Application of loads on a beam may be at its top flange or bottom flange or centroid. How does level of application of load affect the beamdesign?	Understand	4
2.	How are the column buckling and the lateral buckling of beam similar?	Understand	4
3.	How will torsion will be there in beams? What is the difference in St Venant torsion	Understand	4
	and warping torsion?		
4.	Mention common situations where shear might become critical?	Remember	4
5.	What is meant by web crippling?	Remember	4

6.	Design by limit state method as per IS: 800 draft code, a hand operated crane, which is provided in a shed, whose details are: Capacity of crane = 50 kN Longitudinal spacing of column = 6m Center to center distance of gantry girder = 12m Wheel spacing = 3m Edge distance = 1m Weight of crane girder = 40 kN Weight of trolley car = 10 kN.	Understand	4
7.	Design a beam of 5 m effective span, carrying a uniform load of 20 kN/m if the compression flange is laterally supported (Assume $f_y = 250$ N/m^2)	Understand	4
8.	Design a beam of effective span 6.0 m and subjected to a bending moment of 105.3 x 106 Nmm for the following conditions (i) The compression flange is laterally unsupported throughout, (ii)The beam is encased in concrete Checks for deflection and shear are not required. Assume $f_y = 250$ MPa.	Understand	4
9.	Design a simply supported beam of effective span 1.5 m carrying a factored concentrated load of 360 kN at mid span.	Understand	4
10.	Design a simply supported beam of 10 m effective span carrying a total factored load of 60 kN/m. The depth of beam should not exceed 500 mm. The compression flange of the beam is laterally supported by floor construction. Assume stiff end bearing is 75 mm.	Understand	4

UNIT-4

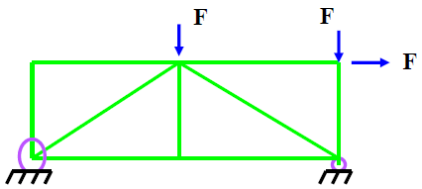
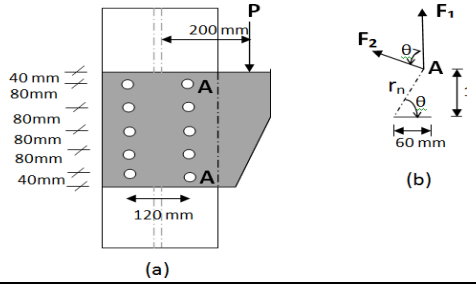
SHORT ANSWER QUESTIONS-

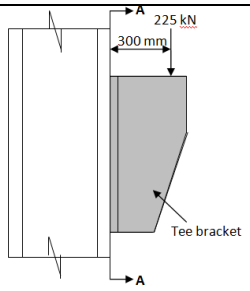
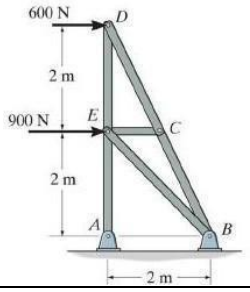
S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	What is the meaning of eccentricity in loading	Remember	5
2.	What is the meant by Eccentric connection in steel structures.	Understand	5
3.	How are the building connections classified based on their moment-rotation characteristics?	Remember	5
4.	What is stiffened seat connection?	Remember	5
5.	When the seated beam connections are preferred	Remember	5
	and name the types?		
6.	Mention some of the requirements of good connections (joints).	Remember	5

7.	What are the possible ways to impose eccentric loading on a welded joint.	Understand	5
8.	The base of a pillar crane is fastened to the foundation by n bolts equally placed on a boltcircle of diameter ***d***. The diameter of the pillar is ***D***. Determine the maximum load carried by any bolt when the crane carries a load ***W*** at a distance ***L*** from the center of the base. Observe the figure below to solvetheproblem. 	Understand	5
9.	A bracket is supported by means of 4 rivets of samesizeasshowninfigurebelow.Determinethe diameter of the rivet if the maximum shear stress is140MPa. 	Understand	5
10.	What are the assumptions that are used when analyzing a simple truss?	Remember	5

LONG ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	How are the building connections classified based on their moment- rotation characteristics?	Understand	5
2.	Describe connection of purlin to rafter with neat sketch.	Understand	5
3.	Explain Anchorages of trusses with concrete	Understand	5
	column neat sketch.		
4.	Given: Loads as shown on the truss. Find the forces in each member of the truss.	Understand	5

5.	For this truss, determine the number of zero-force members. 	Understand	5
6.	An ISLB 300 carrying UDL of 50 kN/m has effective span of 8 m. This is to be connected to the web of girder ISMB 450. Design the framed connection using 20 mm black bolts.	Understand	5
7.	An ISMB 450 is connected to the flange of a column ISHB 300 @618 N/m. The end reaction transmitted the beam is 120 kN. Design an unstiffened seated connection. Use M20 black bolts.	Understand	5
8.	Determine the safe load P that can be carried by the joint shown inFigure below. The bolts used are 20 mm diameter of grade 4.6. The thickness of the Flange of I-section is 9.1 mm and that of bracket plate 10mm. 	Understand	5
9.	Design a bracket connection to transfer an end reaction of 225 kN due to factored loads as in Figure below. The end reaction from the girder acts at an eccentricity of 300 mm from the face of the column flange. Design bolted jointconnecting the Tee-flange with the column flange. Steel is of grade Fe 410 and bolts of grade4.6.	Understand	5

			
10.	Given: Loads as shown on the truss. Determine the force in all the truss members (do not forget to mention whether they are in Tension or Compression). 	Understand	5

UNIT-5

SHORT ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	Give the expression for the optimum depth of plate girder.	Remember	5
2.	Differentiate between a beam and a plate girder.	Remember	5
3.	Where are the plate girders used?	Remember	5
4.	What are the main characteristics of a plate girder?	Remember	5
5.	State some advantages and disadvantages of plate girders over trusses.	Remember	5
6.	List the different elements of a welded plate girder	Understand	5
7.	What are the various types of stiffners?	Remember	5
8.	State the minimum web thickness provisions of a IS 800:2007	Understand	5
9.	What is the range of the minimum thickness of the web that is usually adopted in practice?	Understand	5
10.	Why / where are bearing stiffeners provided?	Understand	5

LONG ANSWER QUESTIONS-

S.No	Question	Blooms Taxonomy Level	Programme Out come
1.	In what sense the design of plate girders by elastic method and limit state method is different?	Understand	5
2.	What is tension field action in plate girders?	Understand	5
3.	How does a plate girder derive post- buckling strength?	Understand	5
4.	Briefly explain the steps involved in the design of plate girders.	Understand	5
5.	Why have bolted and riveted plate girders become obsolete?	Understand	5
6.	Design a welded plate girder 24 m in span and laterally restrained throughout. It has to support a uniform load of 100 kN/m throughout the span exclusive of self-weight. Design the girder without intermediate transverse stiffners. The steel for the flange and web plates is of grade Fe	Understand	5
7.	410. Yield stress of steel may be assumed to be 250 MPa irrespective of the thickness of plates used. Design the cross section, the end load bearing stiffner and connections.	Understand	5
8.	Design a welded plate girder 24 m in effective span and simply supported at ends. It carries an uniformly distributed load of 100 kN/m. draw section at support and front elevation of plate girder.	Understand	5
9.	What are stiffeners and why are they used? How many types of stiffeners are being used in the design of plate girder? Give the conditions (as per IS 800) when stiffeners are required.	Understand	5
10.	A plate girder is subjected to a maximum factored moment of 4000 kN-m and factored shear force of 600 kN. Design girder without any stiffeners.	Understand	5

X. OBJECTIVEQUESTIONS:

UNIT-I

1. The Indian codes which deals with the steel structureis
   (a)IS: 800 (b) IS: 875 (c) IS: 475 (d) IS:400
2. The main advantage of steel structuresis
   (a) Itshighstrength (b) its long servicelife
   (c) its gas &water tightness (d) All theabove
3. With a percentage increase in carbon in steel, itdecreases
   (a) Ductility (b) strength (c) hardness (d) brittleness
4. Poisson's ratio for steel within the elastic limit variesfrom
   (a) 0.15 to 0.20 (b) 0.25 to 0.24 (c) 0.25 to 0.33 (d) 0.33 to 0.35
5. The tensile strength of mild steel for bolts & nuts should not be lessthan
   (a) 32 kg/mm^2 (b) 36 kg/mm^2 (c) 40 kg/mm^2 (d) 44 kg/mm^2
6. The heaviest I-section for same depthis
   a) ISMB b) ISLB c) ISHB d)ISWB
   b) Bending compressive and tensile stresses respectively are calculated basedon net area andgross area
   b) gross area and netarea
   c) net area inbothcases d) gross area in bothcases
7. If the thickness of thinnest outside plate is 10 mm, then the maximum pitch of rivetsin tension will be takenas
   a)120mm b) 160 mm c) 200mm d) 300mm
8. In a gusseted base, when the end of the column is machined for complete bearing on thebase plate, then the axial load is assumed to be transferred to baseplate
   a) fully by directbearing
   b) fully throughfastenings
   c) 50% by direct bearing and 50% throughfastenings
   d) 75% by direct bearing and 25% throughfastenings
9. When the axis of load lies in the plane of rivet group, then the rivets are subjectedto
   a) onlyshearstresses b) only tensilestresses
   c) both (a)and (b) d) none of theabove

UNIT-II

1. The ratio of unsupported length to least radius of gyration is knownas
   (a) Gyration ratio (b)Slendernessratio (c) Both a and b (d) none ofabove

2. The effective length of a compression member of length *L* held in position and restrained in direction at one end and effectively restrained in direction but not held in position at the other end, is
   (a)L (b) 0.67L (c)0.85L (d) 2L

3. A structural member subjected to compressive stress in a direction parallel to its longitudinal axis, is generally known as
   (a) Column (b) stanchion (c) post (d)strut

4. Slenderness ratio of a compression memberis

(a) $\frac{\text{Moments of Interia}}{\text{Radius of gyration}}$ (b) $\frac{\text{Effective length}}{\text{Area of cross-section}}$

(c) $\frac{\text{Radius of gyration}}{\text{Effective length}}$ (d) $\frac{\text{Radius of gyration}}{\text{Area of cross-section}}$

5. The distance between e.g. of compression and e.g. of tension flanges of a plate girder,is knownas
   a. Over all depth b.Cleardepth c.Effectivedepth d.None ofthese
6. If the depth of two column sections are equal, then the column splice isprovided
   a. with filler plates b.with bearing plates c.with filler and hearing plates d.none of these
7. Web crippling generally occurs at the point where
   a. bending moment is maximum b.shearing force is minimum
   c. concentrated loads act d.deflection is maximum

8. According to IS Specifications, the effective length of a column effectively held inposition at both ends and restrained in direction at one end is takenas
   a) 0.67 L b) 0.8 L c) L d) 1.5 L
9. The effective length of a battened strut effectively held in position at both ends butnot restrained in direction is takenas
   a) 1.8 L b) L c) 1.1 L d) 1.5 L
10. The maximum slenderness ratio of a compression member carrying both deadand superimposed loadis
    a)180 b) 200 c) 250 d)350

UNIT-III

1. A beam is defined as a structural member subjected to
(a) Axial loading (b) Transverse loading
(c) Axial andtransverseloading (d) None ofthese.

The area A_p of cover plates in one flange of a built up beam, is given by

(a) $A_p = \frac{Z_{reqd} + Z_{beam}}{h}$ (b) $A_p = \frac{Z_{reqd} + Z_{beam}}{A}$

(c) $A_p = \frac{Z_{reqd} \times Z_{beam}}{h}$ (d) $A_p = \frac{Z_{reqd} - Z_{beam}}{h}$

2. The average shear stress for rolled steel beam section, is
(a)845kg/cm^2 (b)945 kg/cm^2 (c)1025kg/cm^2 (d) 1500 kg/cm^2

3. The rolled steel I-sections are mostly used as beams because theseprovide
   (a) Large moment of inertia with less cross-sectionalarea
   (b) Large moment of resistance as compared to othersection
   (c) Greaterlateralstability (d) All theabove
5. The permissible stress in bending for rolled steel I-beams and channels,is
   (a)1500kg/cm^2 (b)1575kg/cm^2 (c)945kg/cm^2 (d) 1650kg/cm^2

6. Rolled steel beams are designated by Indian Standard series andits
   (a) Weight per metre and depth of its section (b) Depth of section and weight permetre
   (c) Width of flange and weightpermetre (d) Weight per metre and flangewidth.
7. A major beam in a building structure, is knownas
   (a) agirder (b) afloorbeam (c) amain beam (d) all theabove
8. Lacing bars in a steel column should be designed toresist
   a) bending moment due to 2.5% of the columnload
   b) shear force due to 2.5% of the columnload
   c) 2.5% of thecolumn load d) both (a) and(b)
9. Angle of inclination of the lacing bar with the longitudinal axis of the columnshould preferably bebetween
   a) 10°to 30° b) 30° to 40° c) 40° to 70° d)90°
10. Battening is preferable whenthe
   i) column carries axial loadonly
   ii) space between the two main components is not verylarge
   iii) column is eccentrically loaded The correct answeris
   a)only (i) b) only (iii) c) (i) and (ii) d) (ii) and (iii)

UNIT-IV

1. Lug angleis
   a) used with singleangle member b)not used with double anglemember
   c)used withchannel member d)used with channel member
2. Bulb angles are usedin
   a) column building b)bridge building c)ship building d)water tankbuilding
3. Rolled steel angle sections are classifiedas
   a) equal angles b)unequal angles c)bulb angle d)all theabove
4. The stiff portion of a bearing stiffeners is taken equalto
   a)Depth of the beam b)3/4 th depth of the beam c)depth of the beam d)2/3 depth ofbeam
5. According to IS:800 lacing bars resist transverse shear equalto
   a)1.0% of theaxial load b)2.0% of the axial load
   c)2.5% of theaxialload d)3.0% of the axialload
6. The overlap of batten plates with the main members in welded connections should bemore than a)3t b) 4t c) 6t d) 8t where t = thickness of the battenplate
7. The slenderness ratio of lacing bars should not exceed
   a) 100 b) 120 c) 145 d)180
8. Minimum pitch provided in riveted steel tanksis
   a)1.5d b) 2.0d c) 2.5d d) 3.0 d
   where d is diameter ofrivets
9. Shear buckling of web in a plate girder is prevented byusing
   a) verticalintermediatestiffener b) horizontal stiffener at neutralaxis
   c)bearingstiffener d) none of theabove
10. Horizontal stiffener in a plate girder is provided to safeguardagainst
   a) shear buckling ofwebplate b) compression buckling of webplate
   c)yielding d) all of theabove

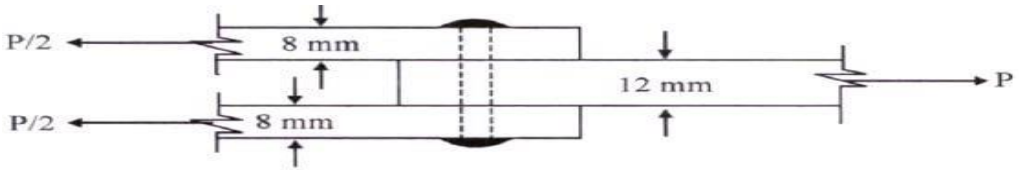
UNIT V

1. In a steel plate girder, the web plate is connected to the flange plates by fillet welding.The size of fillet welds is designed to safelyresist.
   (a) the bending stresses inthe flan (b) the vertical shear force at thesection
   (c) the horizontal shear forces between the flanges and the webplate
   (d) the forces causing buckling in theweb
2. Gantry girders are designed to resist:
   1) Lateral loads 2)Longitudinalload 3) Verticalloads
   (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and3
3. The distance between the outer faces of flanges of a plate girder, is known as
   (a)overall depth (b) clear depth (c)effective depth (d) None ofthese
4. Bearing stiffener in a plate girder is usedto
   a) transfer the load from the top flange to the bottomone
   b) prevent buckling ofweb
   c) decrease the effective depthofweb d) prevent excessive deflection
5. The forces acting on the web splice of a plate girderare
   a)axialforces b) shear and axialforces
   c) shear andbendingforces d) axial and bendingforces
6. Bearing stiffeners are providedat
   i) the supports ii) the midspan
   iii) the point of application of concentrated loads The correct answeris
   a) only(i) b) both (i)and(ii) c) both (i)and(iii) d) (i), (ii) and(iii)
7. Rivets connecting flange angles to cover plates in a plate girder are subjectedto
   a) horizontal shear only b) verticalloadonly c) both (a)and(b) d) none of theabove
8. Bearing stiffener in a plate girder is usedto
   a) transfer the load from the top flange to thebottom one b) prevent buckling ofweb
   c) decrease the effective depthofweb d) prevent excessivedeflection
9. Economical depth of a plate girder correspondsto
   a)minimumweight b) minimum depth
   c)maximumweight d) minimum thickness ofweb
10. Shear buckling of web in a plate girder is prevented byusing
    a) vertical intermediate stiffener b) horizontal stiffener at neutral axis
    c)bearingstiffener d) none of theabove

GATE

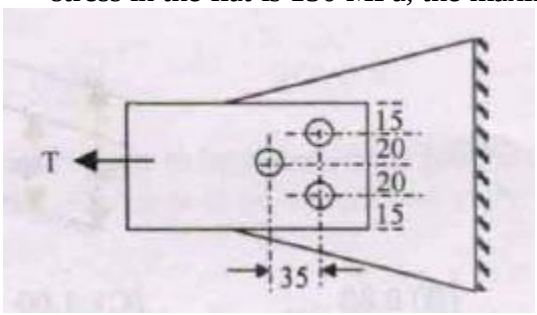
1. Two steel columns P (length L and yield strength fy = 250MPa) and Q (length 2L and yield Strength fy=500MPa) have the same cross-sections and end-conditions. The ratio of buckling load of column P to that of column Qis:
   a)0.5 9 b)1.0 c)2.0 d) 4.0
2. AsymmetricI-section(withwidthofeachflange=50mm,thicknessofeachflange=10mm, depth of web = 100 mm, and thickness of web =10mm) of steel subjected to a shear force of 100 mm. Find the magnitude of the shear in N/mm2) in the web at its junction with the topflange. _____
3. In a steel plate with bolted connections, the rupture of the net section is a mode of failure under
   (A) Tension (B) compression (C) flexure (D)shear

4. Theratioofthetheoreticalcriticalbucklingloadforacolumnwithfixedendstothatofanother column with the same dimensions and material, but with pinned ends, is equalto
   (A) 0.5 (B) 1.0 (C) 2.0 (D) 4.0
5. A 12 mm thick plate is connected to two 8 rnm thick plates, on either side through a 16 rnm diameter power driven field rivet as shown in the figure below. Assuming permissible shear stress as 90 MPa and permissible bearing stress as 270 MPa in the rivet, the rivet value of the joint is



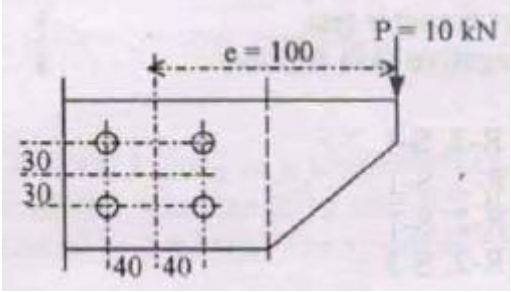
A)56.70 kN (B) 43.29 kN (C) 36.19 kN (D) 21.65 Kn

6. Battening is preferable whenthe
   i) column carries axial loadonly
   ii) space between the two main components is not verylarge
   iii) column is eccentrically loaded The correct answeris
   a) only (i) b) only (iii) c) (i) and (ii) d) (ii) and (iii)
7. A steel flat of rectangular section of size 70 x 6 mm is connected to a gusset plate by three boltseachhavingashearcapacityof15kNinholeshavingdiameter11.5mm.Iftheallowable tensile stress in the flat is 150 MPa, the maximum tension that can be applied to the flatis



   (A) 42.3 kN (B) 52.65 kN (C) 59.5 kN (D) 63.0 kN

8. Abracketconnectionismadewithfourboltsof10mmdiameterandsupportsaloadof10kN at an eccentricity of 100 mm. The maximum force to be resisted by any bolt willbe



   A) 5 kN (8) 6.5 kN (C) 6.8 kN (D) 7.16kN

9.Bearing stiffeners in plate girders are providedto
(a) decrease the effective depth ofweb
(b) transfer the load from the top flange to the bottomflange
(c) prevent buckling of web
(d) increase the bearing capacity of theflange
10.Strength and serviceability of a structure cannot be predicted on account ofseveral unforeseenfactors.
(a)1, 2 and 3 (b) 3 only (c) 2 only (d) 1 only

IES:

1.Two angles of ISA 100 x 100 x 6 have been used as a tie member. The angles are weldedon either side of a gusset and tag welded over its length. The maximum length of the member is: (For ISA 100x100x6, Area = 2334 mm^2 and YXX = 30mm)
(a)5.4 m (b) 6.0 m (c) 12.0 m (d) 24.0 m
2.Gantry girders are designed toresist:
1)Lateral loads 2)Longitudinal load 3)Vertical loads
(a)1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3
3.The effective width of outstand in compound steel columns for design purposes is equalto
(a) half the flange width (b) distance of the free edge from the rivet line
(c) distance of the free edge from thestiffeners
(d) distance of the free edge to the nearest row ofrivets
4.For a steel built up column subjected to an axial force of 1200 kN, the lacing system is tobe designed for resisting transverse shearof
(a)15kN (b)20 kN (c)25kN (d) 30Kn
5.At certain location of a plate girder of web size 1000x10, a pair of bearing stiffeners 100 mmx 5 mm is welded. The effective area of bearing stiffenersis
(a)1000mm^2 (b)2000 mm^2 (c)3000mm^2 (d) 5000 mm^2
6.ISMB 250 (Ze = 410x10^3) mm^3 has been chosen as a beam cross-section to resist a bending moment. Two plates 100 mm x 10 mm are welded to each flange to enhance the moment capacity. The enhanced moment capacityis
(a)71.5kNm (b) 79.5kNm (c) 99.0kNm (d) 148.0kNm
7.Bearing stiffeners in plate girders are providedto
(a) decrease the effective depth ofweb
(b) transfer the load from the top flange to the bottomflange
(c) prevent buckling of web (d) increase the bearing capacity of the flange

8.Which of the following statements is/arecorrect?

1) A steel structure designer can guarantee the safety of thestructure.

2)Working stress method of design of steel structures offers a safer and economical structure.

3)Strength and serviceability of a structure cannot be predicted on account of severalunforeseen factors.

(a)1, 2and 3 (b)3only (c)2only (d) 1only

9.When the effect of wind or earthquake load is taken into account in the design of a riveted connection, the permissible stresses in rivets may be exceeded by

(a) 16.66% (b)33.33% (c) 25% (d)50%

10.A mild steel flat subjected to a tensile force of 840 kN is connectedtoa gusset plate using rivets. If the permissible forces required per pitch length (i) to shear a single rivert, (ii) to crush the rivet and (iii) to tear the plate are 50 kN, 80 kN and 60 kN respectively, then the number of rivets requiredis

(a)12 (b) 14 (c) 16 (d)17

11. The effective throat thickness of a fillet weld dependsupon

(a) angle betweenfusionfaces (b) length ofweld

(c) permissibleshearstress (d) type ofweld

12. When the load line coincides with the centroid of the rivet group, the rivets are subjected to

(a)shearonly (b)tension only (c) bendingonly (d) shear as well astension

13. An ISMB 500 is used as a beam in a multistory construction. From the viewpoint ofstructural design, it can be considered to be 'laterally restrained'when

(a) the tension flange is laterallyrestrained

(b) the compression flange is laterallyrestrained

(c) the web is adequatelystiffened

(d) the conditions in both (a) and (c) are met.

14.A steel column pinned at both ends has a buckling load of 200kN, If the column is restrained against lateral movement at its mid-height, its buckling load will be

(a)200kN (b)283kN (c) 400kN (d) 800 kN

15. Consider the following provisions to possibly improve the shear capacity of a steel girder: 1.Horizontal stiffeners 2.Verticalstiffeners 3.Columnsplice 4.Bearingstiffeners Which of these arecorrect?

(a) 1,2,3 and 4 (b) 3 and4 only (c) 1 and 2 only (d) 2 and 3only

16. In a steel plate girder, the web plate is connected to the flange plates by fillet welding.The size of fillet welds is designed to safelyresist.

(a) the bending stresses in the flanges (b) the vertical shear force at thesection

(c) the horizontal shear forces between the flanges and the webplate

(d) the forces causing buckling in theweb

17. In laced columns, end tie-plates are providedto

(a) check the buckling of column

(b) keep the column components inposition

(c) check the distortion of column sections at ends because of unbalanced

18.Which of the following elements of a pitched roof industrial steel building primarily resists lateral load parallel to the ridge?

(a)Bracing (b) Purlin (c) Truss (d)Column

XIII. WEBSITES:

1. http://www.asce.org
2. http://www.icivilengineer.com
3. http://www.construction-guide.in
4. http://nptel.ac.in/courses/112105171/1

XIV.EXPERTDETAILS:

1. Vinayak Eswaran, Professor & Head of the Department, IITHyderabad
2. Dr.Raja Banerjee, Associate Professor, IITHyderabad
3. Dr.YVD Rao. Faculty In charge, Engineering Services Division, BITS Pilani, Hyderabad Campus
4. Dr. Jeevan Jaidi, Associate Professor, Dept. of Mechanical Engineering, BITS-Pilani, HyderabadCampus
5. Dr P. Laxminarayana, Head, Dept. of Mechanical Engineering, Osmania University College of Engineering,Hyderabad
6. Dr. T.I. Eldho. Department of Civil Engineering, IITBombay

XV. JOURNALS:

1 Thesis Digest on civilEngineering
2 International Engineering and Technology Journal of Civil andStructure
3 International journal of civilengineering
4 Journal of information knowledge and research in civilengineering
5 International journal of civil engineering andtechnology
6 International Journal of Civil Engineering and Applications
7 Recent Trends in Civil Engineering andTechnology
8 World Research Journal of CivilEngineering

XVI. LIST OF TOPICS FOR STUDENTSEMINARS:

1. Mechanical Properties of Steel
2. Riveted, Welded, and BoltedConnections
3. Design of TensionMembers
4. Design of CompressionMembers
5. Design of SteelBeams
6. Design of PlateGirders
7. Design of RoofTruss

XVII. CASE STUDIES / SMALLPROJECTS:

1. Study of various types of connections
2. Study of PlatedGirders
3. Study of Columns and ColumnBase
4. Study of RoofTruss