Hall Ticket No. | | | | | | | | | | | Question Paper Code: ACE012

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER - II

B.TechVI Semester End Examinations (Regular), April – 2020

Regulations: IARE-R16

DESIGN OF STEEL STRUCTURES AND DRAWING

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT-I

1.	(a)	What are the advantages of high strength friction grip bolts?	**[7M]**
	(b)	Design a double cover butt joint with grade of steel Fe410 and grade of bolt 4.6 diameter 16mm to resist a factored load of 150 KN thickness of main plate is 20mm and butt plate is 8mm.	**[7M]**
2.	(a)	Explain the different types of failures in bolted joints with figures?	**[7M]**
	(b)	Two ISF sections 200mmX10mm each and 1.5 m long are to be jointed to make a member length of 3m. Design a butt joint with the bolts arranged in the diamond pattern. The flats are supposed to carry a factored tensile force of 450kN. Steel is of grade Fe410. 20mm diameter bolts of grade 4.6 are used to make the connections. Also determine the net tensile strength of the main plate and cover plate.	**[7M]**

UNIT-II

3.	(a)	Why is it better to choose plastic or compact sections for columns?	**[7M]**
	(b)	Design a column to support a factored load of 1050 kN. The column has an effective length of 7.0m with respect to Z axis and 5.0 m with respect to Y axis. Use steel grade of Fe410.	**[7M]**
4.	(a)	What are the various steps involved in design Laced columns as per IS 800:2007?	**[7 M]**
	(b)	Design a built up column 9 m long to carry a factored axial compressive load of 1100KN. The column is restrained in position but not in direction at both the ends. Design the column with connecting system as battens with bolted connections. Use two channel sections back-to-back. Use steel of grade Fe410.	**[7 M]**

UNIT-III

5. (a) What are the stages involved in designing a laterally supported and unsupported beams? **[7M]**

   (b) Determine the design bending strength of ISLB 350 @ 486 N/m considering the beam to be laterally supported. The design shear force V is less than the design shear strength. The unsupported lengthy of the beam is 3.0 M assume steel of grade Fe410.

6. (a) Explain in detail about shear buckling **[7M]**
   (a) Simple post critical method
   (b) Tension field method

   (b) A simply supported steel joist with a 5.0 m effective span carries a uniformly distributed load of 40 KN over its span inclusive of its self-weight. The beam is supported laterally throughout. Design the beam. Use steel of grade Fe410. **[7M]**

UNIT-IV

7 (a) Explain the design procedure for Unstiffened seat connection. **[7M]**

   (b) A beam ISLB 400 @ 558.19 N/m transmits an end reaction of 230 KN. Due to factored loads to the flanges of a column ISHB 200 @392.4 N/m design the end plate connection using 20 mm diameter bolts of grade 4.6 steel of grade Fe410. **[7M]**

8 (a) Draw the typical sketch to show the following beam column connection: **[7M]**
   (a) stiffened seated connection (b) unstiffened seated connection

   (b) In a framed connection an ISLB 350 @ 485.6 N/m transmits an end reaction of 200 KN and moment of 20 KN/m. under factored loads to a column ISHB 300 @ 576.8 N/m Design the connection. **[7M]**

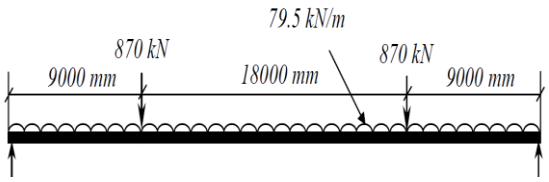
UNIT–V

9 (a) What are the design concepts of a plate girder? **[7M]**

   (b) A plate girder is subjected to a maximum factored moment of 4000kN-m and a factored shear force of 600kN. Find the preliminary section of girder without any stiffeners. **[7M]**

10 (a) What is tension field action in plate girders? **[7M]**

   (b) The girder showed in figure is fully restrained against lateral buckling throughout its span. The span is 36m and carries two concentraed loads 870 kN acting at 9 m from left support and 9mm fromm right support. Design the plate girder. **[7M]**



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COURSE OBJECTIVES:
The course should enable the students to:

I	Discuss the concepts of structural steel design conforming to the IS 800 design code
II	Identify various types of structural steel and its properties also define concepts of Limit State Design.
III	Analyze structures using plastic method of analysis and evaluate collapse load and plastic moment capacity.
IV	Design compression members, beams, connections and girders.

COURSE OUTCOMES(COs):

CO	Description
CO 1	Know the materials, making of iron and steel, types of structural steel, mechanical properties of steel, concepts of plasticity yield strength, loads and combinations loading wind loads on roof trusses, behaviour of steel, local buckling. Concept of limit state design – different limit states as per IS 800:2007. Design strengths deflection limits, serviceability, bolted connections, welded connections, efficiency of joint, prying action types of welded joints, design of tension members, design strength of members.
CO 2	Know the design of compression members, buckling class, slenderness ratio, strength design, laced battened columns, column splice, column base, slab base.
CO 3	Know the design of beams, plastic moment, and bending and shear strength laterally supported beams. Design, built up sections, large plates web buckling, crippling and deflection of beams, design of purlin.
CO 4	Know the design of eccentric connections with brackets, beam end connections, web angle, unstiffened and stiffened seated connections (bolted and welded types) and design of truss joints.
CO 5	Know the design of welded plate girders, optimum depth, design of main section, design of end bearing stiffness and intermediate stiffness. Connection between web and flange and design of flange splice and web splices.

COURSELEARNING OUTCOMES:
Students, who complete the course, will have demonstrated the ability to do the following:

ACE012.01	Know the materials, making of iron and steel.
ACE012.02	Know the types of structural steel, mechanical properties of steel.
ACE012.03	Know the concepts of plasticity yield strength.
ACE012.04	Understand loads and combinations loading wind loads on roof trusses.
ACE012.05	Understand behavior of steel, local buckling.
ACE012.06	Concept of limit state design – different limit states as per IS 800:2007.
ACE012.07	Concept of design strengths deflection limits, serviceability.
ACE012.08	Evaluate the bolted connections.
ACE012.09	Evaluate welded connections, efficiency of joint.

ACE012.10	Analyze the prying action types of welded joints.
ACE012.11	Understand the design of tension members and design strength of members.
ACE012.12	Understand the design of compression members, buckling class, slenderness ratio.
ACE012.13	Understand the strength design, laced battened columns.
ACE012.14	Understand the design of column splice, column base, and slab base.
ACE012.15	Understand the design of beams, plastic moment.
ACE012.16	Analyze the bending and shear strength laterally supported beams.
ACE012.17	Understand the design, built up sections, large plates web buckling.
ACE012.18	Analyze the crippling and deflection of beams, design of purlin.
ACE012.19	Understand the design of eccentric connections with brackets.
ACE012.20	Analyze the beam end connections, web angle, unstiffened and stiffened seated connections, and design of truss joints.
ACE012.21	Understand the design of welded plate girders, optimum depth, and design of main section.
ACE012.22	Understand the design of end bearing stiffness and intermediate stiffness.
ACE012.23	Analyze the Connection between web and flange and design of flange splice and web splices.

Mapping of Semester End Examination to Course Outcomes

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	ACE012.08	Evaluate the bolted connections	CO 1	Understand
	b	ACE012.11	Understand the design of tension members and design strength of members.	CO 1	Remember
2	a	ACE012.08	Evaluate the bolted connections	CO 1	Understand
	b	ACE012.11	Understand the design of tension members and design strength of members.	CO 1	Understand
3	a	ACE012.12	Understand the design of compression members, buckling class, slenderness ratio.	CO 2	Understand
	b	ACE012.13	Understand the strength design, laced battened columns	CO 2	Remember
4	a	ACE012.13	Understand the strength design, laced battened columns	CO 2	Understand
	b	ACE012.14	Understand the design of column splice, column base, and slab base.	CO 2	Understand
5	a	ACE012.15	Understand the design of beams, plastic moment	CO 3	Remember
	b	ACE012.16	Analyze the bending and shear strength laterally supported beams.	CO 3	Understand
6	a	ACE012.16	Analyze the bending and shear strength laterally supported beams.	CO 3	Remember
	b	ACE012.17	Understand the design, built up sections, large plates web buckling	CO 3	Understand
7	a	ACE012.19	Understand the design of eccentric connections with brackets.	CO 4	Remember
	b	ACE012.20	Analyze the beam end connections, web angle, unstiffened and stiffened seated connections, and design of truss joints	CO 4	Understand

8	a	ACE012.19	Understand the design of eccentric connections with brackets.	CO 4	Remember
	b	ACE012.20	Analyze the beam end connections, web angle, unstiffened and stiffened seated connections, and design of truss joints	CO 4	Understand
9	a	ACE012.21	Understand the design of welded plate girders, optimum depth, and design of main section.	CO 5	Understand
	b	ACE012.22	Understand the design of end bearing stiffness and intermediate stiffness	CO 5	Remember
10	a	ACE012.21	Understand the design of welded plate girders, optimum depth, and design of main section.	CO 5	Understand
	b	ACE012.22	Understand the design of end bearing stiffness and intermediate stiffness	CO 5	Remember

Signature of Co-Ordinator **HOD, CE**