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B.TECH
(SEM -VII) THEORY EXAMINATION 2020-21
DESIGN OF STEEL STRUCTURES

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.**2 x 10 = 20**

a.	What are the types of structural steel?
b.	What is ductility?
c.	Define efficiency of a joint.
d.	What do you mean by welded connection?
e.	What do you mean by strut?
f.	What are lug angles ? why lug angles are used ?
g.	What do you meant by a tie member ?
h.	Define radius of gyration and effective length of column ?
i.	What do you mean by laterally restraint beam?
j.	What is the main purpose of a gantry girder ?

SECTION B

2. Attempt any three of the following:**10x3=30**

a.	A single bolted lap joint is provided to connect two plates of thickness 10mm each at a pitch of 80mm. Calculate the efficiency of joint. Use M16 bolt of grade 4.6 and steel of grade Fe 410.
b.	Find the suitable pitch for single bolted lap joint for plate 10 mm thick. Use 4.6 grade of bolt of diameter 16mm and Fe 410 grade of steel
c.	Select a suitable angle section to carry a factored tensile force of 290 kN. Assuming a single row of M 24 bolts and design strength $f_y = 250$ N/mm
d.	Design a double angle discontinuous strut to carry a load of 250 kN. The length of the strut between c/c of intersections is 3.85 m.
e.	State the difference between purlin and girder. Describe the design of purlin with their load combinations.

SECTION C

3. Attempt any one part of the following:**10x1=10**

a.	How is the net area calculated when angles are connected through both the legs with staggered bolts.
b.	Calculate the strength of M20 bolt of grade 4.6 for the following cases. The main plates to be joined are 12 mm thick. (1) Single cover butt joint: the cover plate being 12mm thick. (2) Double cover butt joint : each of the cover plate being 10 mm thick

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4. Attempt any one part of the following: 10x1=10

a.	A tie member consists of two ISMC 250 @ 298.22N/m. The channels are connected on either side of a 12 mm thick gusset plate . Design the welded joint to develop the full strength of the tie. However the overlap is to be limited to 400mm. The channel section is to be welded at site.
b.	Find the tension carrying capacity of single angle ISA 100mmx100mmx8mm connected to a gusset plate by means of three bolts of 20 mm diameter at a pitch of 80 mm c/c in one line. Use steel of grade Fe-410 and bolts of grade 4.6.

5. Attempt any one part of the following: 10x1=10

a.	Write down step by step procedure for design of tension member subjected to axial load and bending.
b.	Determine the tensile strength of a roof truss diagonal made of 100x75x10mm angle section connected to the gusset plate by 4mm fillet size filled weld and 140 mm long on one end 310 mm long on other end. Use steel of grade Fe-410 .

6. Attempt any one part of the following: 10x1=10

a.	List the various steps involved in the design of a gantry girder.
b.	A compound column consisting of ISMB 400 @ 603.86 N/m with one cover plate 300mmx20mm on each flange. Determine the value of the least radius of gyration.

7. Attempt any one part of the following: 10x1=10

a.	An ISMB 550 @ 1037 kN/m has been used as simply supported beam over a span of 4m. the ends of the beam are restrained against torsion but not against lateral bending. Determine the safe uniformly distributed load which the beam can carry. Use steel of grade Fe 410.
b.	A single bolted double cover butt joint is used to connect two plates each 6mm thick. The thickness of cover plate is 4mm. the bolts used are of 20 mm diameter, provided at a pitch of 60 mm. calculate the load carried by one joint and its efficiency. Use steel of grade Fe 410 and bolts of grade 4.6.