OF THE SUBJECT : DESIGN AND DRAWING OF
. STRUCTURES REGULATION : R16
SE : B.TECH
CH : CIVIL
YEAR / SEMESTER : III YEAR
– II SEM
PURPOSE : QUESTION BANK

UNIT-I- CONNECTIONS

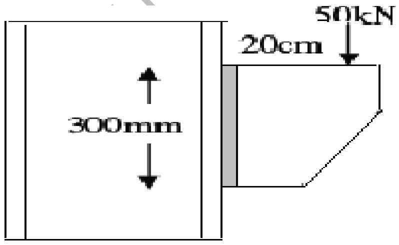
1.a Explain various types of welding processes with neat diagrams-----------------------3M
b. List out and explain various advantages and disadvantages of welded connections over riveted connections---3M
c. Classify welds according to the following:
i) According to position, ii) According to type of joint. Explain with neat diagrams-----4M

2. A tie bar $120mm\times10mm$ is to be connected to the other of size of $120mm\times14mm$. The tie bars are to be loaded by a pull of 120 kN . Find out the size of end fillets such that the stress in the end fillets is the same. Take the permissible stresses in the weld is 110N/mm^2-- 10M

3. Design a connection to join two plates of size 300 x 8 mm in Fe410 grade steel to mobilize the tensile strength of the plate using site fillet welds. (a) a lap joint is used and (b) a butt joint is used-----------10M

4. a. What are the advantages of welded connections? Explain the following for fillet weld considering I.S specification;
i)size of weld, ii) Throat thickness and iii) Length of weld-----------------------6M
b. With neat sketches explain different types of welds---------------------------------------4M

5. a. Write about the methods for inspecting welds--2M
b. Determine the depth of the fillet weld required to join a plate bracket with flange of a stanchion as shown in figure (Load = 50 kN)



6. Two plates $180mm \times 10mm$ are to be connected in a lap joint, the connection being made by transverse filleted weld and necessary plug welds. Design the connection. Use $6mm$ welds.
   b. A circular plate $125mm$ in diameter is welded to another plate along the periphery by $6mm$ fillet weld. Find the maximum twisting moment that can be applied to the plate in plane, if the stress in the weld is not to exceed $110 N/mm^2$

7. Design a splice for tension member sections 160 x 10mm and 250 x 14mm the member is subjected to a pull of 200kN. Assume fy=250N/mm2---------------------------10M

UNIT-II – BEAMS

1. Design a laterally unsupported beam for the following data.
   Effective span: 4m
   Maximum bending moment: 550 KNm
   Maximum shear force: 200kN
   Steel grade: Fe 410

2. A beam of span 8m carries a 20kN/m U D L of over the whole length. Design the beam assuming that the compression flange is laterally restrained throughout the length. Take $f_{y=}$ $250N/mm^2$. The compression flange of beam is laterally supported throughout.

3. Design a beam of 5m effective span, carrying a uniform load of 20kN/m if the compression flange is laterally unsupported. And also check for deflection and shear.

4. Design a simply supported beam of span 6 m and it has to carries a factored UDL of 30 kN/m (excluding the self-weight). The beam is laterally supported throughout. Use f_y = 250 MPa.

5. Calculate the moment carrying capacity of a built-up beam of section ISMB 450 plus flange plates and with an effective span of 8000 mm. The ends are framed to the columns and the grade of steel fy = 250 MPa. Two flange plates each of size 250 x12 mm are provided on the compression side and one plate is curtailed at 1600 mm from both edges.
6. Design a simply supported beam of span 4 m carrying a reinforced concrete floor capable of providing lateral restraint to the top compression flange. The uniformly distributed load is made up of 20kN/m imposed load and 20 kN/m dead load (section is stiff against bearing).

Assume Fe 410 grade steel.

UNIT-III –TENSION MEMBERS, COMPRESSION MEMBERS ROOF TRUSSES.

1. Determine the tensile strength of a roof truss member consisting of 2 ISA 90 × 60 × 6 mm connected on either side by long legs to a gusset plate 8 mm thick by 4mm welds over an effective weld length of 200 mm.
2. Determine the tensile strength of roof truss diagonal of 150×75×10mm connected by its long lag to a gusset plate 8mm thick by 6mm welds. Adopt fy = 250 MPa.
3. Design I section purlin with and without sag bars for a trussed roof from the following data;
   Span of roof = 10 m;

Spacing of purlins along slope of truss = 2.5 m;
Spacing of Truss = 4 m;
Slope of roof truss = 1 vertical, 2 horizontal
Wind load on roof surface normal to roof = 1100 N/m2
Vertical load from roof sheets, etc = 150 N/m2.

4. Determine the design loads on the purlins of an industrial building near visakhapatnam, given :Class of building: General with life of 50 years, Terrain category 2. Maximum dimension=40m, width of building=15m, Height at eve's level=10m, Topography= □ □ less than 30,permeability= medium, span of truss = 16 m, pitch=1 in 5, sheeting = A.C. sheets, spacing of purlins= 1.35m, spacing of truss=4m.
5. Design a tension member 3.4m between c/c of intersections and carrying a pull of 145kN, the member is subjected to reversal of stresses.
6. Explain various components of roof trusses with neat sketches in brief.

UNIT- IV – DESIGN OF COLUMNS

1. A column section ISHB@577N/m is carrying a factored axial load of 600kN, a factored moment of 30kN and a factored shear force of 60kN. Design a suitable column splice. Assume ends are milled.
2. A column section ISHB 450@ 872kN/m is to be spliced with a column ISHB 300 @ 588N/m. The load on the column is 600kN. Design a suitable splice.
3. A steel column is to take a central load of $1600kN$ is to be built of four equal angles forming a $50cm*50cm$ square. The height of the column is to be $6m$ with hinged ends. Design a suitable column section and a lacing system. Draw to scale the plan and elevation.
4. Design a built up column consisting of two channels placed toe to toe. The column carries an axial factored load of 16kN. The effective height of column is 10m. Design the lacing also.Draw to a scale the cross section and sectional elevation of the column with lacing details.
5. Design a suitable section for a column to carry an axial load of 350kN. The column is 4m long and is fixed in position as well as direction at one end and fixed in position at the other end.
6. Design a built up column composed of two channel sections placed back to back, carrying on axial load of 1500 kN. The effective length of the column is 7 m. Also design a single Lacing system.
7. A steel column is to take a central load of $1600kN$ is to be built of four equal angles forming a $50cm \times 50cm$ square. The height of the column is to be $6m$ with hinged ends. Design a suitable column section and a lacing system. Draw to scale the plan and elevation.

UNIT- V – DESIGN OF COLUMN FOUNDATIONS

1. Design a gusseted base for a column section ISHB 350@724N/m subjected to an axial load of 3500kN. The base rests on a M15 concrete pedestal. The safe bearing pressure of concrete may be assumed to be 4N/mm2. Draw to scale the plan and elevation.
2. Design the base plate for a column ISHB 350@724 N/m carrying a load of 600 kN and a bending moment of 1000 kN-m. It is to be supported on a concrete pedestal having the permissible bearing pressure of 4.2 MPa. Also design the concrete base, if the bearing capacity of soil is 300 kN/m2. Draw to scale the cross-section of the column and sectional elevation of the base plate of the column.
3. Design a slab base for a column consisting of ISHB 300 @58.8kg/m and carrying an axial load of 1000kN. Take allowable bearing pressure on concrete as 4N/mm2.
4. Design a slab base for a built-up column consisting of $2-MC$ 250 placed back to back

separated by a distance of $160mm$. The factored axial load on the column is $1200kN$.

5. A column is made of one ISHB 300 @ 58.8 kg/m and one plate 400mm ×12mm symmetrically placed on each flange. The column thus measures 324mm × 400mm overall dimensions. The column carries an axial load of 1800kN. The column is to be provided with a gusseted base resting on concrete base. Design the gusseted base giving full details of the connections. Take safe compressive stress on concrete as 30MPa.
6. What is a slab base? Explain various features of a column base with neat sketches. Describe procedure for designing a slab base.

UNIT-VI – DESIGN OF PLATE GIRDER GANTARY GIRDER

1. Design a simply supported gantry girder to carry an electric overhead travelling crane for the following data:
   Crane capacity=320kN
   Weight of crane and crab=300kN
   Weight of crane=200kN
   Minimum approach of crane hook=1.20m
   Distance between c/c of wheels=3.20m
   Distance between c/c of gantries=16.0m
   Span of gantry girder=4.00m
   Weight of rails=300N/m
   Height of rails=75mm
   Yield stress of steel=280MPa
   Draw to scale i) the cross-section, ii) the longitudinal section.
2. Design as.s gantry girder to carry one electric over head travelling crane.
   Span of gantry girder=6.5m
   Crane capacity=250kN
   Span of crane girder=16m
   Self weight of crane girder excluding trolley =200kN
   Draw to scale i) the cross-section, ii) the longitudinal section.
3. Design a welded plate girder for a simply supported bridge deck beam with clear span of 20 m, subjected to the following:
   DL including self weight = 20 KN/m
   Imposed load = 10 KN/m
   Two moving loads = 150 KN each spaced 2 m apart
   Assume that the top compression flange of the plate girder is restrained laterally and prevented from rotating. Use mild steel with f_y = 250 MPa. Design as an unstiffened plate girder with thick webs. Draw to scale the longitudinal section and cross section.

4. 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 with intermediate transverse stiffeners. The steel for the flange and web plates is of grade Fe 410. Design the cross section, the end load bearing stiffener and connections need not be designed. Use post critical method for the design. Draw to scale the elevation and cross section showing all the details of reinforcement.