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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

May 2023 Semester End Make-Up Examinations

Programme: B.E. **Semester: VII**
Branch: Civil Engineering **Duration: 4 hrs.**
Course Code: 21CV7PCDDG **Max Marks: 100**
Course: Design and Drawing of RCC and Steel Structures **Date: 18.05.2023**

Instructions: 1. Part A: **Qn No 1 is compulsory. Internal choice is provided between Qn No 2 and 3.**

Part B: Qn No 4 is compulsory. Internal choice is provided between Qn no 5 and 6.

2. Use of IS 456-2000, IS 800-2007 and structural steel hand book is Permitted
3. Assume missing data if any suitably and state the same clearly.

PART-A

1	A beam ISLB 400@56.9kg/m is connected to the flange of a column ISHB 500 @86.9kg/m by an unstiffened seated bolt connection. The seat angle is of ISA 150mmx150mmx8mm and of length 200mm. Four bolts each of 18mm dia are used to connect the seat angle to the flange of the column in two rows. The connection between the angle and the flange of the beam is also by four bolts of 18mm dia in two rows. The web of the beam is connected to the flange of the column through two angles ISA 100x100x8mm with 8 bolts of 18mm dia, 4 each on either sides of the web of the beam. A cleat angle of ISA 75x75x6mm is connected to the top flange of the beam to the flange of the column through two bolts of diameter 18mm diameter on each leg of the angle. Draw to a suitable scale showing the details of the connection (i)side view (ii) section through beam	**10**
2	Design the central section with bearing stiffeners and intermediate stiffeners to carry a superimposed load of 20kN/mtr along with a concentrated load of 300kN at the center of the span over a simply supported span of 20meters. Adopt elastic critical stress method and intermittent fillet welded connection of size 6mm and width 60mm with a gap of 60mm for all connections. Assume RC support base of 450mm width to support the beam at its ends.. Draw to a suitable scale the following showing the details of connection: (i)Central section of the girder (ii)Half longitudinal section	**40**

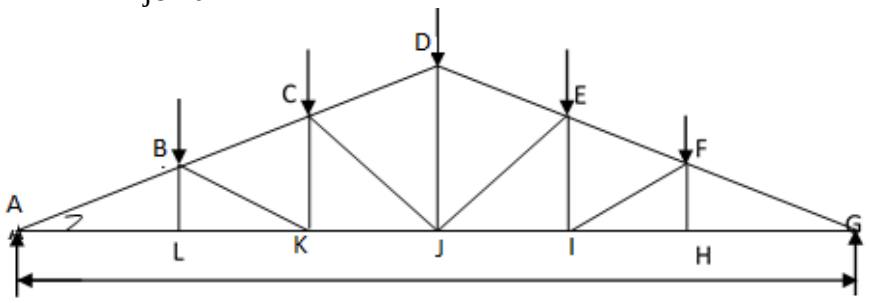
OR

3 The line diagram of a Howe roof truss is shown in the figure below. The loads acting in each member is shown in the tabulation. Design the top, bottom chord members and support A of the roof truss along with their end connections with gusset plate by using close tolerance turned bolts. The left support may be considered as resting on a roller and the right support may be considered as resting on a hinge. Assume a support reaction of 60kN. **40**

Draw to a suitable scale,

(i) Elevation of the truss for half the span.

(ii) Enlarged view of the apex joint of the truss and left support joint



Members	Length (m)	Force(kN)	Nature of Force
AB,GF	2.31	240.0	Compression
BC,FE	2.31	210.0	Compression
CD,ED	2.31	160.04	Compression
AL,GH	2.0	207.84	Tension
LK,HI	2.0	207.84	Tension
KJ,IJ	2.0	181.82	Tension
BL,FH	1.154	0.0	------
BK,FI	2.31	30.0	Compression
CK,EI	2.31	15.0	Tension
CJ,EJ	3.05	66.05	Compression
DJ	3.46	60.0	Compression

PART-B

4 A RC slab of 150mm and of inner dimensions 4 meters x 6 meters is supported by beams all-round the slab. One longer side of the slab has a cantilever projection of 1.5 meters. Beams are of dimension 230mm x 450mm.Reinforcement details are as follows **10**

i)Slab:

shorter span: 10mm dia bar at 100mm c/c

longer span:10mm dia bar at 150mmc/c

Bend for bars at $1/5^{th}$ span.

For cantilever portion of slab, provide extra top bars of 10mm at 100mmc/c.

ii)Beams:

Top bars, 2nos of 12mm dia

Bottom bars of 2 nos of 16mm dia with additional 2 bars of 16 mm dia.

Shear reinforcement: 2 legged 8mm bars at 150mmc/c.

Draw to a suitable scale with reinforcement details:

i)Plan of slab

ii)Longitudinal section of longer beam

5	Design a cantilever retaining wall to retain earth to a depth of 4 meters with a 50% curtailment of main steel in the stem. Assume angle of repose of soil=30^o, density of soil=19kN/m^3, friction between soil and concrete=0.5. SBC of soil=180 kN/m^2. Apply the necessary checks. Use M20 concrete and Fe 415 steel. Draw to a suitable scale with reinforcement details: i)cross section of stem ii)plan of base slab	**40**
	OR	
6	Design a Combined footing which consists of two columns of size 600mmx6000mm which are separated by 5.0 meters along their center lines. One column is at a distance of 0.5m from its center to the edge of boundary. The load on the column which is near the boundary is 700kN and load on the other column =1200kN. Assume an angle of repose of soil=30^o, Density of soil=19kN/m^3 and SBC of soil=200kN/m^3. Apply the necessary checks. Draw to a suitable scale: i) sectional view through the beam connecting column and footing ii) plan of footing showing reinforcement details	**40**

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