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320731(20)

B. E. (Seventh Semester) Examination, April-May 2020

(New Scheme)

(Civil Engg. Branch)

STRUCTURAL ENGINEERING DESIGN-III

Time Allowed : Four hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory and attempt any* ***two*** *parts from rest of* ***three*** *parts (b),(c) & (d) in each question and all questions carry equal marks.*

Unit-I

1. (a) Draw the neat sketch of the plate girder and name the elements. 2

(b) What do you understand by proportioning of the section of plate girder? Explain in brief. How would you calculate flange area? 7

(c) 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. The steel for the flange and web plates is of grade Fe 410. Yield stress of the steel may be assumed to the 250 MPa irrespective of the thickness of plates used. Design cross section only. 7

(d) Design a plate girder using intermediate transverse stiffness for following data :

(i) Maximum bending moment = 11448 kN-m

(ii) Maximum shear force = 1908 kN

(iii) Flange plate both end = 560 × 50 mm

(iv) Optimum depth of web = 1871·9 mm

(v) Optimum thickness of web = 10·95 mm

(vi) Grade of steel Fe 410, yield stress 250 MPa 7

Unit-II

2. (a) What is moment amplication factor? 2

(b) What is need of using equivalent uniform moment factors in the design of beam-columns? Explain. 7

(c) A column ISHB 300 @ 618 N/m in a framed building supports spandrel beams in its top end. The beams are welded to column flanges and transfer end reactions of 225 kN one beam and other beam 375 kN and axial compressive force of 675 kN from the top storeys on column. The bottom end of the column has similar beam-to-column arrangement as well as loading. Check the adequacy of the column if it's effective length is 3·2 m about both the axes. The beam reactions and the loads have been computed from factored loads. 7

(d) Design an I-section truss member for the following data :

(i) Effective length of member $L = 3 \cdot 5$ m

(ii) Factored axial tension $T = 450$ kN

(iii) Factored moment at two ends of the member about strong axis : Mz 35 kN-m and 20 kN-m respectively.

(iv) Grade of steel : Fe 410 7

Unit-III

3. (a) Gives different types of loads and load combinations for which the gantry girder is designed. 2

(b) A column ISHB 350 @ 661·2 N/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M-15 grade of concrete pedestal. Use 24 mm diameter bolts of grade 4·6 for making the connections. 7

(c) A column section ISHB 450 @ 907·4 N/m is subjected to following factored loads.

(i) Axial Compressive load, $P = 500$ kN

(ii) Moment, $M = 100$ kN-m

Assume M-30 grade of concrete for pedestal and a square base plate, design the following :

(a) Thickness of bare plate. Assume Fe grade of steel : $f_u = 410$ MPa, $t_y = 250$ MPa. 7

(d) Gives design procedure of gantry girder in detail with relevant formulae to be used. 7

Unit-IV

4. (a) Differentiate between rigid, semi-rigid and flexible connections. 2

(b) An ISLB 300 @ 369·8 N/m transmits an end reaction

of 385 kN under factored loads to the web of ISMB 450 @ 710·2 N/m. Design a bolted framed connection. Steel is of grade Fe 410 and bolts are of grade 4·6. 7

(c) Design a stiffened seat connection for an ISMB 350 @ 514 N/m transmitting an end reaction of 320 kN (factored load) to a column section ISHB 300 @ 576·8 N/m. The steel is of grade Fe 410 and bolts of grade 4·6. 7

(d) A bracket plate 10 mm thick is used to transmit a reaction of 140 kN at an eccentricity of 100 mm from the column flange as shown in fig. 1. Design the weld. 7

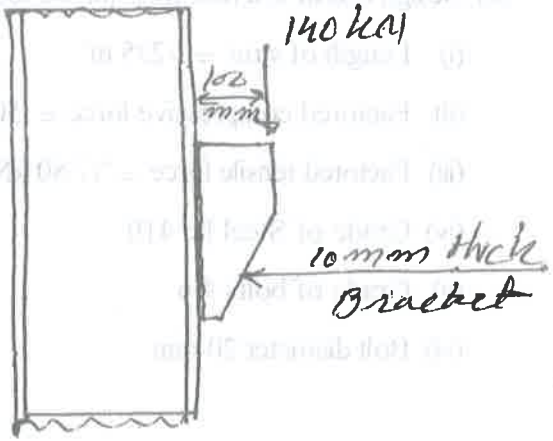

Fig. 1

Unit-V

5. (a) Give possible load conditions which is applicable for design of root trusses? 2

(b) Explain design procedure of root truss in details. 7

(c) Design the principal rafter of a fink-type roof truss for the following data. Also design its connection using 20 mm diameter bolts.

(i) Design compressive load 165 kN (DL+LL)

(ii) Design tensile load 60 kN (DL+ WL)

(iii) Length of rafter panel 2·235 m

(iv) Grade of steel Fe 410, Grade of bolts 4·6 7

(d) Design a strut in a root truss for the following data :

(i) Length of strut = 2·235 m

(ii) Factored compressive force = 50 kN (DL + LL)

(iii) Factored tensile force = 17·80 kN (DL + WL)

(iv) Grade of Steel Fe 410

(v) Grade of bolts 4·6

(vi) Bolt diameter 20 mm 7