Printed Pages – 5 Roll No. : .....

320731(20)

B. E. (Seventh Semester) Examination, April-May 2021

(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) from each question is compulsory. Attempt any* ***one*** *part from part (b) & (c) of each question. IS 800 : 2007 and Steel Tables are permitted in examination. Assume the steel is of grade Fe 410 and Fy 250 for all purpose.*

Unit-I

1. (a) Enumerate components of plate girder. 2

(b) Design a welded plate girder without intermediate vertical stiffener for 20 meter span and laterally supported throughout. It has to support a uniform

load of 100 kN/m throughout the span exclusive of self weight. Also design the connections. 14

(c) Design a welded type plate girder with thin web and end stiffener avoiding intermediate vertical stiffener for 20 meter span and laterally supported throughout. It has to support an uniform load of 80 kN-m throughout the span exclusive of self-weight. 14

Unit-II

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

(b) Discuss in detail about general behaviour of beam-columns as compared with beams and columns. Also draw the neat sketch to support your justifications. 14

(c) A non-sway column in a building frame with flexible joints is 4 m high and subjected to the following load and moment :

Factored axial load = 500 kN

Factored moment Mz =

27 kN-m (at top of column)

45 kN-m (at bottom of column)

Design a suitable beam column assuming f_y = 250 N/mm^2

Take effective length of the column as 0·8 L along both the axes. 14

Unit-III

3. (a) Briefly explain column bases. 2

(b) A column ISHB 350 @ 67·4 kg/m carries an axial compressive factored load of 1700 kN. Design a suitable bolted gusset base. The base rests on M15 grade concrete pedestal.

Take 24 mm diameter of bolts of 4·6 grade, for making the connections. 14

(c) Design a gantry, without lateral restraint along its span, to be used in an industrial building carrying an overhead travelling crane for the following data :

Centre to center distance between gantry rails (i.e. span of the crane) = 15 m

Centre to center distance between gantry rails (i.e. span of the gantry girder) = 7·5 m

Crane capacity = 200 kN

Self-weight of the crane girder excluding trolley = 200 kN

Self-weight of the trolley electrical motor hooks etc = 40 kN

Maximum hook approach = 1·2 m

Distance between wheel centers = 3·5 m

Self-weight of the rail sections = 300 N/M

Diameter of crane wheels = 150 mm

Yield stress of steel = 250 N/mm^2

14

Unit-IV

4. (a) Briefly describe with suitable sketch for the building connection based on their moment rotation characteristics. 2

(b) Design a seat connection for a factored beam end reaction of 110 kN. The beam section is ISMB 250 @ 365·9 N/m connected to the flange of column section ISHB 200 @ 365·9 N/m using bolted connections. Steel is of grade Fe-4110 and bolts of grade 4·6. 14

(c) Design a stiffened seat connection for a factored beam end reaction of 320 kN. The beam section is

ISMB 350 @ 514 N/m connected to the flange of column section ISHB 300 @ 576·8 N/m using bolted connections. Steel is of grade Fe-4110 and bolts of grade 4·6. 14

Unit-V

5. (a) What will be the relation for economical spacing of roof truss, if t, p. r are the cost of truss, purlin and roof covering respectively? 2

(b) Write the various steps involved in the design of roof truss members. 14

(c) Design a strut in a roof truss for the following data : 14

Length of the strut = 2·235 m

Factored compressive force = 50 kN (due to D.L. and L.L.)

Factored tensile force = 17.80 kN (due to D.L. and L.L.)

Grade of steel = Fe 410

Grade of bolts = 4.6

Bolt diameter = 20 mm

14