Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering

Term-End Examination

June, 2006

BCE-032 : THEORY OF STRUCTURES-I

Time : 2 hours *Maximum Marks : 70*

Note : *Question no. 1 is **compulsory**. Attempt any **four** questions from the remaining. Total number of questions to be attempted are five. Assume suitable data wherever necessary and mention it clearly. Use of calculator and steel table is permitted.*

1. Choose the most appropriate answer from the given alternatives : *7×2=14*

(i) The weakest section in computation of strength in a fillet weld is

(a) side perpendicular to the load axis

(b) throat of the fillet

(c) side parallel to the load axis

(d) None of the above

(ii) In rolled steel beams, the shear force is resisted by

(a) flanges only

(b) web only

(c) top flange only

(d) both the flanges and the web

(iii) The strength of a riveted joint is equal to

(a) Bearing strength of the rivets

(b) Tearing strength of the plates

(c) Shearing strength of the rivets

(d) Least of (a), (b) and (c)

(iv) The effective area of cross-section of the built up rolled angles to be taken into consideration for tension steel member is

(a) area of both the legs of the angles

(b) net area of the legs connected by rivets

(c) net area of the legs connected by rivets plus a portion of the outstanding legs

(d) net area of all the legs of the angles

(v) The maximum admissible slenderness ratio of steel column subjected to dead and live load only is

(a) 120

(b) 250

(c) 180

(d) 350

(vi) The member of roof truss which supports purlin is called

(a) Main tie

(b) Rafter

(c) Main sling

(d) Main strut

(vii) The minimum thickness of a plate to be used as bending element exposed to weather and accessible to maintenance should be

(a) 4·5 mm

(b) 6 mm

(c) 8 mm

(d) 10 mm

2. Analyse the frame as shown in Fig 1. Draw Bending Moment diagram also. *14*

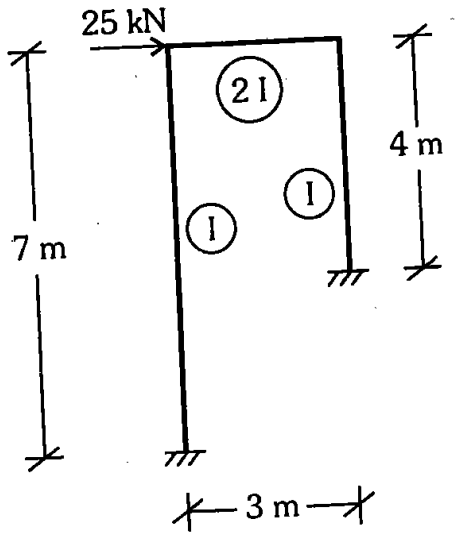

Fig. 1

3. The bottom chord of a roof truss tension member carries a tensile force of 250 kN. The effective length of the member is 1·5 m. Design the member as double angles placed back to back and connected to both sides of a 10 mm thick gusset plate using 6 mm fillet weld. *14*

(f_y = 250 N/mm^2)

4. A masonry dam 8 m high is 2 m wide at the top and 6 m wide at the base. It retains water to a depth of 7·0 m. The water face of dam is vertical. Calculate the maximum and minimum stress at the base. The weight of masonry is 23 kN/m^3.

14

5. A built up column consists of two ISMC 250 @ 30 kg/m. Determine the maximum permissible load for this column if channels are placed so as to give column equal resistance to bending about either axis. The effective length of column is 4·5 m and steel is of f_y = 250 N/mm^2. The channels are braced appropriately. Take appropriate value of allowable compressive stress from Table 1.

14

Table 1

l/r	σ_{ac} (MPa)
10	150
20	148
30	145
40	139
50	132
60	122
70	112
80	101
90	90
100	80

6. Determine the fixed end moments and the support reaction for the fixed beam as shown in Fig 2. Also draw Bending Moment and Shear Force diagrams. *14*

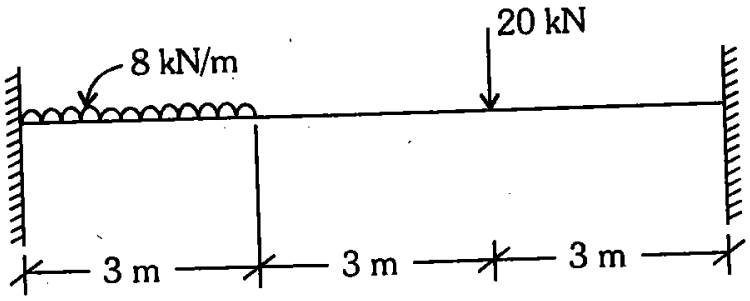

Fig. 2

7. (a) A beam has a span of 25 m. Draw the influence line diagram for BM and SF at a point 'A' 10 m from the left hand support. *7*

(b) Determine maximum BM at 'A' of the above beam when two connected wheel loads 8 kN and 6 kN at a fixed distance of 2 m roll from left to right. 6 kN load leads while rolling. *7*

8. A simply supported beam has an effective span of 6 m. It carries a uniformly distributed load of 30 kN/m over its entire length and a concentrated load of 20 kN at mid span. The compression flange may be assumed to be laterally supported throughout its length. Design an I section beam using steel of f_y = 250 N/mm^2. *14*