TED (15) – 4014 Reg. No. .....

(REVISION — 2015) Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

THEORY OF STRUCTURES - II

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Define slenderness ratio of a column.
2. Show the core area of rectangular and circular sections.
3. Define a fixed beam.
4. Define elastic curve of a loaded beam.
5. Define carry over factor in moment distribution method. (5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. Calculate the safe compressive load on a hollow cast iron column, one end rigidly fixed and the other end hinged of 150mm external diameter, 100mm internal diameter and 10m length. Use Euler's formula with a factor of safety of 5. Take E as 95 GPa.
2. Find the crippling load by Rankine's formula for a hollow cylindrical steel column of 38mm external diameter and 2.5mm thick. Take the length of the column as 2.3m and hinged at both ends. Take E = 205 GPa, Rankine's constant as 335 MPa and $\frac{1}{7500}$.
3. State the conditions for the stability of a dam.
4. For a solid circular section of diameter 'd' show that the limiting value of eccentricity for no tension to develop in the section is $\frac{d}{8}$.

Marks

5. A 250mm long cantilever of rectangular section 40mm wide and 30mm deep carries a uniformly distributed load per unit length. Calculate the value of 'w', if the maximum deflection not to exceed 0.5mm. Take E = 70 GPa.

6. A cantilever beam 120mm wide and 150mm deep is 1.8m long. Determine the slope and deflection at the free end of the beam, when it carries a point load of 20kN at its free end. Take 'E' as 200 GPa.

7. Explain Hardy cross method of moment distribution for the analysis of indeterminate structures. (5×6 = 30)

PART — C

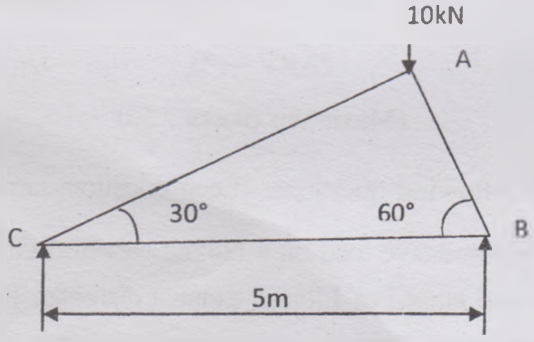
(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

III (a) A 'T' section 150mm×120mm×20mm is used as a strut of 4m long with hinged at its both ends. Calculate the Euler's crippling load, if Young's modules for the material be 200GPa. Take Moment of inertia of the beam section, $I_{xx} = 6.09 \times 10^6 mm^4$ and $I_{yy} = 5.069 \times 10^6 mm^4$. 8

(b) The truss ABC shown in figure has a span of 5 metres. It is carrying a load of 10 kN. Find the forces in the members AB, AC and BC.



7

OR

IV (a) A built up column consisting of 150mm×100mm R.S.J with 120mm×12mm plate riveted to each flange. Calculate the safe load, the column can carry, if it is 4m long having one end fixed and other end hinged with a factor of safety 3.5. Take the properties of the built up column as Area = 5047mm², $I_{xx} = 27.32 \times 10^6 mm^4$ and $I_{yy} = 4.404 \times 10^6 mm^4$. Assume crushing strength of the column 315MPa and Rankine's constant (a) = $\frac{1}{7500}$. 9

(b) What is meant by equivalent length of column ? Write the equivalent length for various end conditions. 6

Marks

UNIT — II

V (a) A hollow circular column having external diameter of 350mm and wall thickness 25mm. It carries a vertical load of 80 kN at the outer edge of the column. Calculate the maximum and minimum intensities of the stresses at the section. 8

(b) A beam of 6m span has its ends built in and carries a uniformly distributed load of 3kN/m. Find the maximum bending moment and deflection. Given EI = 20×10^8kN/mm^2. 7

OR

VI (a) A short column 100 mm ×100mm is subjected to an eccentric load of 80 kN at an eccentricity of 40mm in the plane bisecting the two opposite faces. Find the maximum and minimum intensities of stresses at the base section. 8

(b) Explain the following terms related to retaining wall.

(i) Weep holes (ii) Active earth pressure (iii) Passive earth pressure 7

UNIT — III

VII (a) A timber beam of rectangular section 120mm wide and 240mm deep is simply supported over a span of 4m. If the deflection of the beam is not to exceed 4mm, find the maximum value of central point load the beam can support. Take young's modules, E = 110 kN/mm^2. Also calculate the slope at ends when this load is carried. 8

(b) Apply Mohr's theorems to determine the slopes and deflections of a cantilever with point load at free end having length 'L' and point load 'W'. 7

OR

VIII (a) A simply supported beam of span 9m is loaded with two point loads of 40kN and 30kN at a distance of 2m and 6m respectively from left support. Using Macaulay's method, calculate deflection under the loads. 8

(b) A cantilever beam 3m span carries a point load of 25 kN at the free end. Using moment area method, find the slope and deflection at the free end. Take E = 200kN/mm^2 and moment of inertia of the section is 360×10^6mm^4 . 7

UNIT — IV

IX (a) A two span continuous beam has two equal spans with a point load 'W' at the middle of each span. Find the fixed end moment at the middle support and sketch the BM diagram and shear force diagram. Take EI as constant. 10

(b) Explain how to find distribution factor for the members OA, OB, OC meet at a rigid point 'O'. The ends 'A&B' are fixed and 'C' is hinged. 5

OR

X A continuous beam ABC, 8m long consists of two spans AB = 3m and BC = 5m. The span AB carries a UDL of 50kN/m and BC carries a UDL of 30kN/m. Find the support moment at B and the reactions at the supports. Sketch the S.F and B.M diagrams. Take EI as constant. 15