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(REVISION — 2015)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

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 limit of eccentricity of a rectangular column section width B and thickness D.
3. Show the elastic curve of a fixed beam due to external loading.
4. Reproduce the equations for slope and deflection for a simply supported beam with central point load.
5. Define distribution factor for a member in moment distribution method. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. A steel rod 5m long and 40mm diameter is used as a column, with one end fixed and other end free. Determine the crippling load by Euler's formula. Take E as 200GPa.
2. A masonry dam of trapezoidal section is vertical on water face. The width of the dam at the top is 4m and its width at the bottom is 12m. The height of the dam is 23m and it contains water up to a height of 20m above the base. Draw the stress distribution diagram of the dam. Take the specific weight of the dam material is $20kN/m^3$ and specific weight of water is $10kN/m^3$.
3. Explain the following.
   (a) Angle of repose (b) Weep holes (c) Active earth pressure.
4. A simply supported beam of span 6m is subjected to a uniformly distributed load over the entire span. If the deflection at the centre of the beam is not to exceed 4mm, compute the value of the U D load the beam can carry. Take $E = 200 \times 10^3$ N/mm^2 and $I = 300 \times 10^6$ mm^4.

Marks

5. Compute the maximum slope and deflection of a cantilever beam of length 'L' carrying a point load 'W' at the free end using moment area method.
6. Illustrate the theorem of three moments and reproduce the equation.
7. Explain the following terms in moment distribution method.
   (a) Stiffness factor (b) Carryover moment (c) Unbalanced moment $(5 \times 6 = 30)$

PART — C

(Maximum marks : 60)

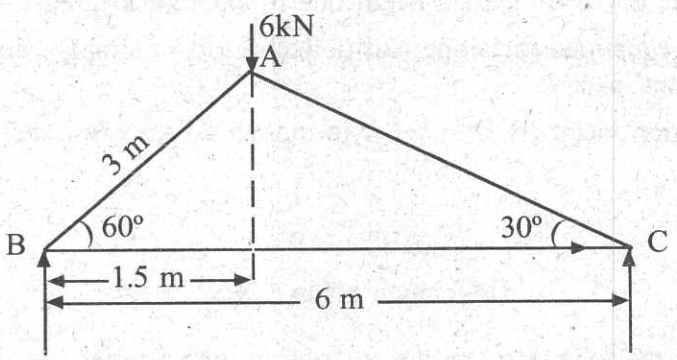
(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

III (a) Compute the Euler's crippling load for a hollow cylindrical steel column 38 mm external diameter and 2.5mm thick. The length of the column is 2.3m and hinged at its both ends. Take E = 205GPa. Also determine the crippling load by Rankine's formula using constants.

$\sigma c = 335 N/mm^2$ and 'a' = $\frac{1}{7500}$ 8

(b) The truss ABC shown in figure has a span of 6 m. It is carring a load of 6 kN. Find the forces in the members AB, AC and BC.



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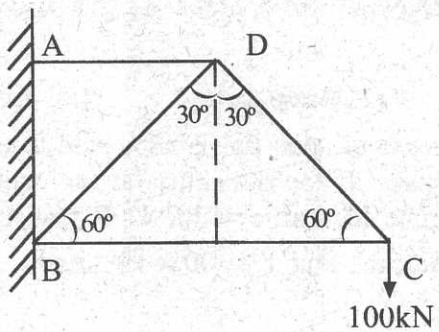
OR

IV (a) A solid rectangular column of length 4m is having a cross section of 200mm × 100mm. If the ends of the member is hinged, find the Euler's crippling load.

Take E = 200kN/mm². 8

(b) Compute the magnitude and nature of forces in the members of the truss shown in figure by method of joints.



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Marks

UNIT — II

V (a) A hollow steel column having 25cm external diameter and 20cm internal diameter. The column carries an eccentric compressive load of 500kN at a distance 10cm from its axis. Determine the maximum tensile and compressive stress. Also draw the stress distribution diagram. 8

(b) A concrete dam of trapezoidal section having vertical water face is 25m height. The width of the dam is 12m at the base and 5m at the top. Compute (i) The resultant pressure on the base per metre length (ii) The point where the resultant pressure cuts the base (iii) Eccentricity of the resultant. The height of the free surface of water above the base is 20m and specific weight of concrete is 25kN/m^3 and that of water is 10kN/m^3. 7

OR

VI (a) A rectangular column 20cm wide and 15cm deep is carrying a vertical load of 1000kN at an eccentricity of 5cm in a plane bisecting the depth. Determine the maximum and minimum intensities of stress in section. 8

(b) Compute the maximum and minimum intensities of pressure at the base of a 12m high retaining wall with top width 3m and base width 6m. Specific weight of the soil and wall material are 20kN/m^3 and 25kN/m^3 respectively. Assume angle of repose as 30°. 7

UNIT — III

VII (a) A simply supported beam of span 4m is carrying a uniformly distributed load of 2kN/m over the entire span. Find the maximum slope and deflection of the beam. Take E = 200Gpa and I = 400 × 10^3 mm^4. 8

(b) Explain Macaulay's method of slope and deflection of a simply supported beam with central point load. 7

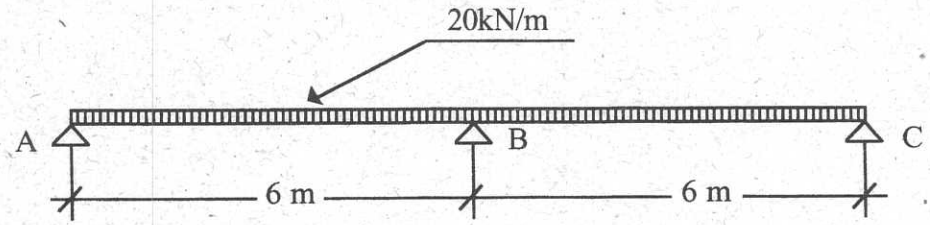
OR

VIII (a) Explain moment area method for finding out slope and deflection of a cantilever beam with uniformly distributed load over the entire span. 8

(b) A beam 3m long simply supported at its ends is carrying a point load at its centre. If the slope at the ends of the beam not to exceed 1°, find the deflection at the centre of the beam. 7

UNIT — IV

IX (a) A continous beam ABC 12m long rests on three supports A, B and C at the same level and is loaded with uniformly distributed load of 20kN/m as shown in figure. Determine the moments over the beam and draw the bending moment diagram. Assume flexural rigidity *EI* as constant.



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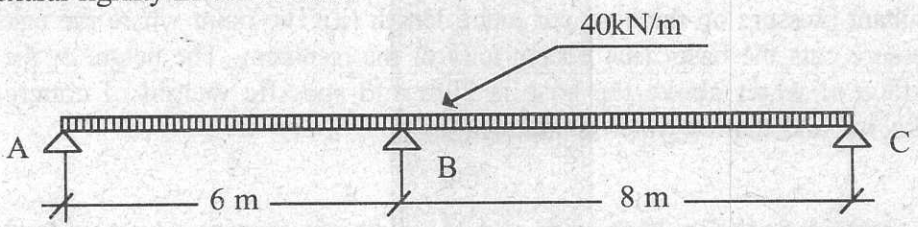
Marks

(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. 7

OR

X (a) A continuous beam ABC 14m long rests on three supports A, B and C as shown in figure. The beam is loaded with uniformly distributed load of 40kN/m. Determine the moments over the beam and draw the bending moment diagram. Assume flexural rigidity *EI* as constant.



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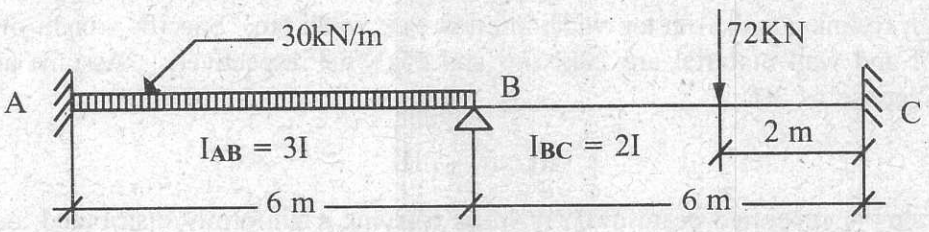
(b) Analyse the beam shown in figure by moment distribution method and draw the bending moment diagram.



Assume E is constant for the beam. 7