TED (15/19) – 3013
(Revision – 2015/19)

N22 - 08643

Reg.No……………..
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE – NOVEMBER – 2022

THEORY OF STRUCTURES - I

(Maximum Marks : 100) (Time : 3 hours)

PART – A
(Maximum Marks : 10)

Marks

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

1. Define centre of gravity.
2. State Poisson's ratio.
3. Define bending moment.
4. Write the concept of point of contra flexure in over hanging beam.
5. Define neutral axis. (5x2=10)

PART –B
(Maximum Marks : 30)

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

1. A simply supported beam AB 6m long carries point loads 5kN and 7kN at C and D respectively and a udl of 10kN/m from A to C. If AC=2m and BD=1.5m. Find reactions at the supports A&B.
2. State parallel axis theorem and perpendicular axis theorem.
3. Calculate the strain energy which can be absorbed in a rod of 2.5m long and $1000mm^2$ in cross sectional area when a pull of 20kN is suddenly applied on it. Take E = 200Gpa.
4. A reinforced cement concrete column 300mmx400mm has 4 reinforcement bars of 20mm diameter. If the permissible stress in concrete is $5N/mm^2$ and modular ratio is 18, Calculate the load carrying capacity of the column.
5. Find maximum shear stress induced in a solid circular shaft of diameter 150mm when the shaft transmits 150kN power at 180rpm.
6. A cylindrical vessel of 400mm internal diameter with 10mm thick plates is subjected to an internal pressure of 2.5Mpa. Calculate the circumferential and longitudinal stresses induced in the plates.
7. Write the assumptions made in Theory of Simple bending. (5x6=30)

PART – C

(Maximum Marks : 60)

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

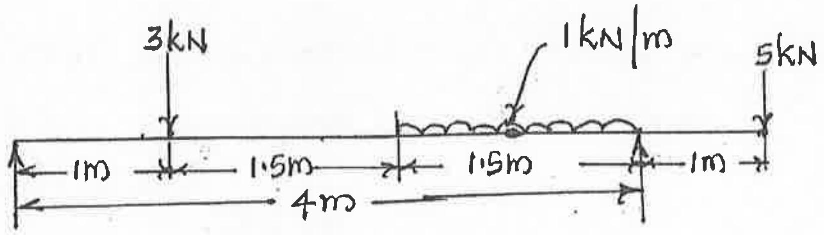
UNIT – I

III. (a) Find the position of centre of gravity of an angle section of longer leg 150mm x12mm and short leg 100 x12mm.(longer leg is vertical leg). (8)

(b) Two forces 120N and 80N are acting at a point. If the angle between the forces is 60°. Determine the magnitude and direction of resultant force. (7)

OR

IV. (a) Calculate the support reaction of an overhanging beam as shown in figure. (8)



(b) Derive the equation to find the polar moment of inertia of a hollow circular section having outer and inner diameters are D and d respectively. (7)

UNIT – II

V. (a) A short hollow cast iron cylinder of wall thickness 10mm is to carry a safe compression load of 600 k N. Determine its outside diameter, if the ultimate crushing stress for the material is 540Mpa.Use factor of safety 6. (8)

(b) Two parallel walls 6m apart are stayed together by a steel rod 25mm diameter passing through metal plates and nuts at each end. The nuts are tightened when the rod is at a temperature of 100°C. Determine the stress in the rod when the temperature falls down to 60°C. Take E=200Gpa and Co-efficient of thermal expansion is $12x10^{-6}$/°C. (7)

OR

VI. (a) A bar 300mm long is 50mm square in section for120mm of its length, 25mm diameter for 80mm and 40mm diameter for the remaining length. If a tensile force of 100kN is applied to the bar. Calculate the maximum and minimum stresses produced in it, and the total elongation. Assume uniform distribution of load over the cross section. E for material $2x10^5$ N/mm^2. (8)

(b) A bar of 30mm diameter is subjected to a pull of 80kN. The measured extension in a gauge length of 200mm is 0.12mm and the change in diameter is 0.004mm. Calculate Poisson's ratio and modulus of elasticity. (7)

UNIT –III

VII. (a) An overhanging beam ABC, AB=4m and BC=2m is simply supported at A and B. It carries a udl of 2kN/m over its entire length. Draw the SF and BM Diagrams and find the position of point of contra flexure. (8)

(b) A hollow circular shaft of 30mm outside diameter and thickness of metal of 3mm is subjected to a torque of 80Nm. Find the shear stress at the outer and inner faces of the cross section of the shaft. (7)

OR

VIII. (a) A simply supported beam of length 6m carries a point load of 3kN and 6kN at distances of 2m and 4m from the left end. Draw the SFD and BMD. (8)

(b) What thickness of metal pipe would be required for a CI pipe 800mm diameter carries a pressure of $1N/mm^2$, permissible stress for CI is $20N/mm^2$. (7)

UNIT – IV

IX. (a) Derive the Simple bending equation. (8)

(b) A cantilever of length 5m, fails when a load of 5kN is applied at the free end. If the section of the beam is 30x60mm. Find the stress at failure. (7)

OR

X. (a) A rectangular beam 400mm deep and 200mm wide is simply supported over a span of 10m, what uniformly distributed load per entire run, the beam can carry if bending stress is not exceed $150N/mm^2$. (8)

(b) Derive the section modulus of a hollow circular section of external diameter of D and internal diameter d. (7)

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