TED (10)–3021

(REVISION—2010)

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THIRD SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY—OCTOBER, 2013

THEORY OF STRUCTURES –I

(Common for CE, AR, QS, EN and WR)

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

(Maximum marks : 10)

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. State 'principle of moments'.
2. What is meant by 'least radius of gyration' ?
3. What is called 'strain' ?
4. What is the general relation between 'shear force' and 'bending moment' at the section of a beam ?
5. What are two types of stresses developing in a thin cylinder when containing fluid in it ? (5×2=10)

PART—B

(Maximum marks : 30)

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

1. Find the reactions of a simply supported beam 4m long carrying point loads of 20kN and 30kN at a distance of 1m and 3m from left end.
2. State and explain the two theorems of moment of inertia.
3. Derive the strain energy formula when applying gradual load, on an elastic body.
4. Derive relation for the power transmitted when a shaft is subjected to an average torque 'T' under a rotating speed of N rpm.
5. Draw SFD and BMD for simply supported beam of span l and with u.d.l. of W/m over entire span.
6. Derive the expression for the circumferential stress developed in a thin cylindrical shell under fluid pressure.
7. How can Rankines formula be applied for short and long columns ? (5×6=30)

Marks

PART—C

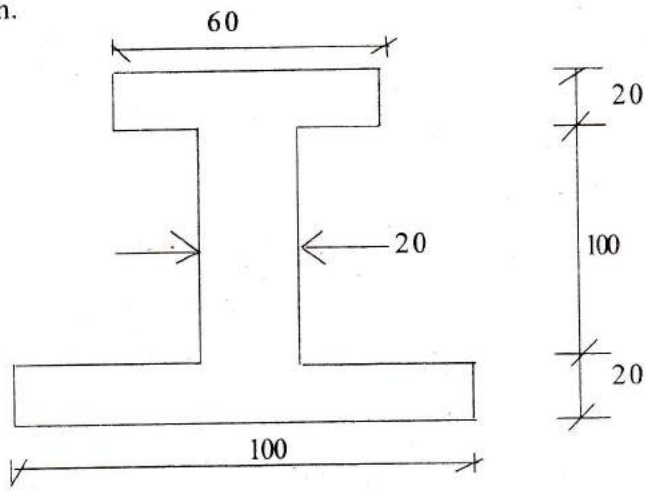
(Maximum marks : 60)

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

UNIT—I

III (a) Differentiate between centroid and centre of gravity. 3

(b) An I section is made up of three rectangles as shown in figure. Find the moment of inertia of the section about the horizontal and vertical axis passing through the cg. of section.



All dimensions are in mm. 12

OR

IV (a) State 'principle of resolution' and explain method of resolution for resultant in a system of forces. 7

(b) A load of 1.5kN resting on a inclined rough plane, can be moved up the plane by a force of 2kN applied horizontally or by force of 1.25kN applied parallel to the plane. Find the inclination to the plane and the coefficient of friction. 8

UNIT—II

V (a) Calculate the strain energy per unit volume due to extension of steel bar having elastic limit of 200N/mm^2 and E = 2×10^5 N/mm^2. 4

(b) A bar 20mm diameter is subjected to pull of 35kN. The measured extension over a gauge length of 200mm is 0.1mm and change in diameter is 0.0035mm. Find the Poisson's ratio and three modulus values. 11

OR

VI (a) A bar of 3m long and 60mm diameter is subjected to a tensile load of 200kN. Find the instantaneous stress when the load is applied suddenly. 3

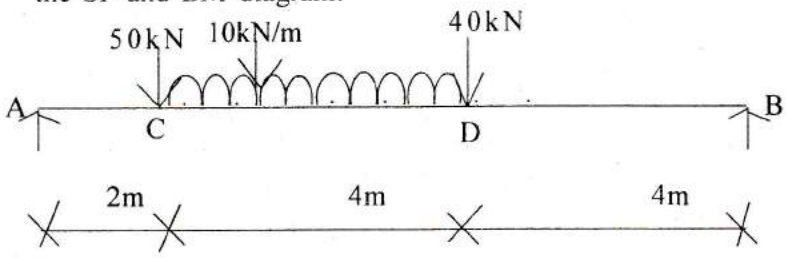
(b) A cylindrical bar is 20 mm in diameter and 1m long. During the tensile test it was found that longitudinal strain is 4 times the lateral strain. Calculate the modulus of rigidity and bulk modulus if its elastic modulus is 1×10^5 N/mm^2. Find the change in volume also when the bar is subjected to hydrostatic pressure of 100N/mm^2. 12

Marks

UNIT—III

VII (a) Explain the term 'polar modulus' of a shaft section. 3

(b) A simply supported beam of length 10m carries a udl and two point load as shown in the figure. Calculate the maximum bending moment value after sketching the SF and BM diagram.



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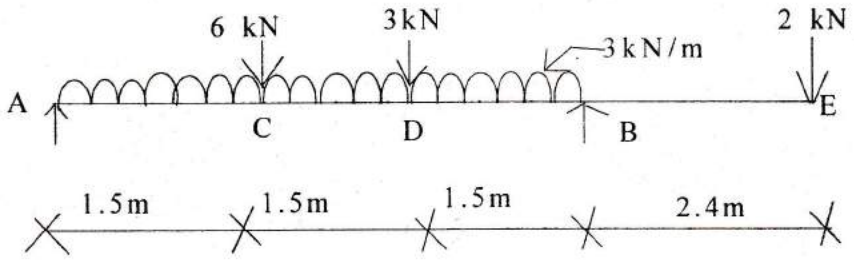
OR

VIII (a) A circular shaft of 30mm diameter is subjected to a torque of 0.60 kN-M. Determine the maximum shear stress developed in the shaft. 3

(b) Figure shows a loaded beam. Draw shear force and bending moment diagram giving important numerical values. Also calculate the maximum bending moment values.



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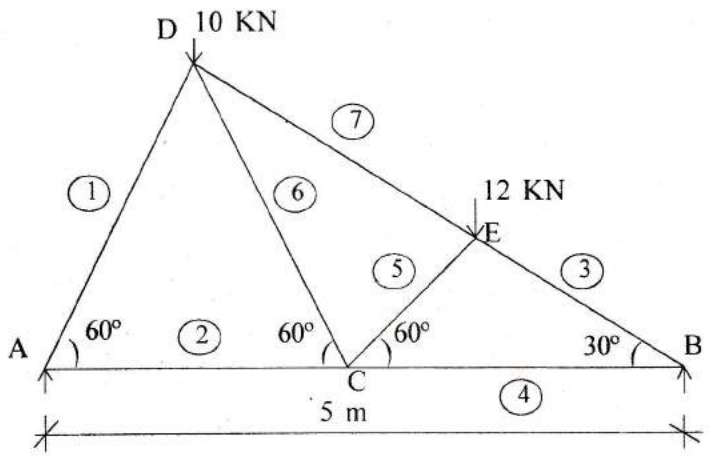
UNIT—IV

IX A truss of span 5m is loaded as shown in figure. Find the reaction and forces in the members of the truss by the "method of joints".



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OR

Marks

X (a) A cylindrical shell of 500mm diameter is required to withstand an internal pressure of 4 Mpa. Find the minimum thickness of the shell if the maximum tensile strength of plate material is 400 mpa and efficiency of joint is 65%. Take the factor of safety as 5. 5

(b) A built up column has length 5m with one end fixed and other end hinged. Calculate the safe axial load by Rankines formula using factor of safety of 3.

Least moment of inertia = 440.4×10^4 mm^4

Cross sectional area = 5047 mm^2

Rankines constant, a = 1/7500

fc = 320 N/mm^2. 10
