TED (15) – 4021

(REVISION — 2015)

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FOURTH SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/ TECHNOLOGY — APRIL, 2017

APPLIED MECHANICS AND STRENGTH OF MATERIALS

(Common for ME, TD and WP)

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. Define coefficient of linear expansion.
2. Define centroid.
3. List any four types of rivet failure.
4. What is spring index ?
5. Name four end conditions of columns. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. Draw stress - strain diagram of mild steel under tension and identify the significant points.
2. State the laws of solid friction.
3. Derive the moment of inertia of a circular section.
4. Determine the allowable load on a single riveted lap joint with 10mm plate thickness and 50 mm wide. The rivet diameter is 12 mm and stress values are σ_t = 148 N/mm^2, σ_b = 195 N/mm^2 and τ = 110 N/mm^2.
5. Find the thickness of a pipe, containing water with a pressure head of 75 m. The weight of water is 9810 N/mm^3 and permissible stress is 20 N/mm^2. Diameter of pipe is 500 mm.
6. Distinguish between closely coiled and open coiled helical spring.
7. Derive the differential equation for simple bending. $(5 \times 6 = 30)$

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Explain principle of super position. 5

(b) The following data refers to a tension mild steel bar.

(i) diameter = 30 mm.

(ii) gauge length = 200 mm

(iii) Extension at a load of 100kN is 0.139 mm

(iv) load at elastic limit = 230kN

(v) maximum load = 360kN

(vi) Total extension = 56 mm

Find : (a) Strain at 100kN (c) Young's modulus

(b) Ultimate stress (d) Elastic limit stress 10

OR

IV (a) Explain the temperature stress when yield is permitted. 5

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

UNIT — II

V (a) How to find out the centroid of a complex shape by principle of momentum ? 5

(b) A block weighing 147 N is resting on a 45° rough inclined plane. This block is tied by a horizontal string which has a tension of 49 N. Find (i) frictional force on the block (ii) normal reaction of the inclined plane (iii) coefficient of friction between the surfaces of contact. 10

OR

VI (a) Explain parallel axis theorem. 5

(b) Find the moment of inertia of a rectangular lamina of 40 mm wide and 80 mm deep. Find also the least radius of gyration and the section modulus. 10

UNIT — III

VII (a) What is the importance of caulking and fullering ? How to perform it ? 5

(b) A boiler shell is made of 10 mm plate having safe tensile stress of 100 N/mm^2. Diameter of the shell is 1.5 m. If the efficiency of the longitudinal and circumferential joints are 70% and 40% respectively. Calculate the maximum permissible steam pressure. 10

OR

Marks

VIII (a) Illustrate any five welded joint. 5

(b) A solid circular shaft running at 300 rpm transmits 200 kW. Corresponding shear stress produced is 100 N/mm^2. Calculate the suitable diameter of the shaft. 10

UNIT — IV

IX (a) Explain different types of beams. 5

(b) A hollow cast iron column whose outside diameter is 200 mm, has a thickness of 20 mm. It is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using factor of safety 4. For cast iron σc = 550 N/mm^2, α = 1/1600, E = 8 × 104 N/mm^2. 10

OR

X (a) Classify columns. 5

(b) A beam is supported by two vertical supports 4m apart. It projects 1m beyond the right hand support. Two point loads 3kN and 6kN act at 1m and 3m from the left hand support. One kilo Newton load acts at the end of overhanging length. Draw SF and BM diagrams. Mark the point where the maximum bending occurs and find point of contra flexure, if any. 10

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