TED (10)–3021 Reg. No. .....

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

THEORY OF STRUCTURES–I

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

[*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. State 'Lami's theorem'.
2. Define centroid.
3. State any two types of Loading which causes strain energy in a deforming body.
4. What is general relation between the rate of Loading and shear force at the section of a beam ?
5. Define 'slenderness ratio'. (5×2=10)

PART—B

(Maximum marks : 30)

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

1. Two equal forces are acting at a point with an angle of 60° between them. If the resultant force is equal to $20\sqrt{3}$ N, find the magnitude of each forces.
2. Explain the method of locating the centre of gravity by moments of a irregular lamina.
3. Explain any three mechanical properties of metals.
4. Explain shear stress variation diagram of a circular shaft under torsion.
5. Deduce the expression for maximum bending moment in case of a cantilever carrying udl of w/metre throughout its length, with sketches.
6. Derive the expression for longitudinal stresses developed in a thin cylindrical shell under fluid pressure.
7. Specify the effective lengths of columns for various end conditions. (5×6=30)

Marks

PART—C

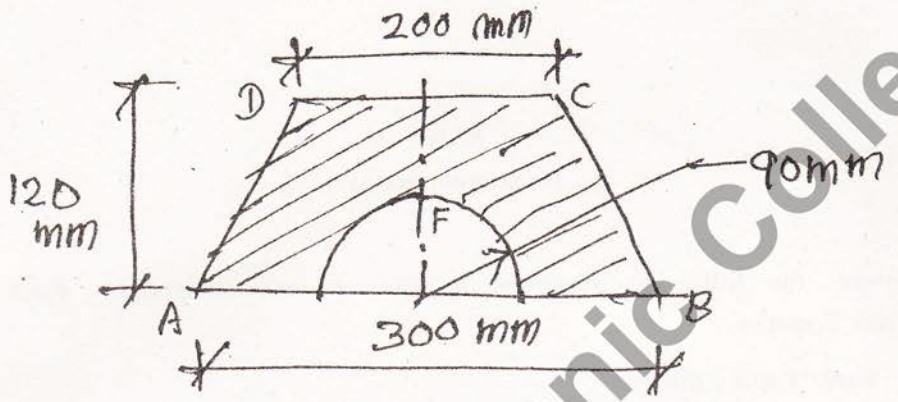
(Maximum marks : 60)

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

UNIT—I

III (a) Calculate the polar moment of inertia of a circular section of diameter 'd'. 3

(b) A semi circle of 90 mm radius is cut out from a Trapezium. Find the position of cg. from the figure :



12

OR

IV (a) Two forces act at an angle of 120°. The bigger force is 40 N and resultant is perpendicular to smaller one. Find the smaller force. 8

(b) A body of weight 500 N is pulled upon an inclined plane by a force of 350 N. The inclination of plane is 30° to the horizontal and the force is applied parallel to the plane. Determine the coefficient of friction. 7

UNIT—II

V (a) An axial pull of 20 kN is suddenly applied on a steel rod 2.5 m long and 1000 mm^2 in cross-section. Calculate the strain energy which can be absorbed in the rod. Take E = 200 GPa. 5

(b) An MS plate 150 mm wide and 20 mm thick is 5 m long carrying an axial pull of 300 kN. If E = 200 KN/mm^2 and $\frac{1}{m}$ = 0.26, calculate the change in dimension and volume of flat. 10

OR

VI (a) A mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. Ends of rods are brazed together and composite bar is subjected to an axial pull of 40 kN. Find the stresses developed in the rods. Es = 200 GPa. Ec = 100 GPa. 7

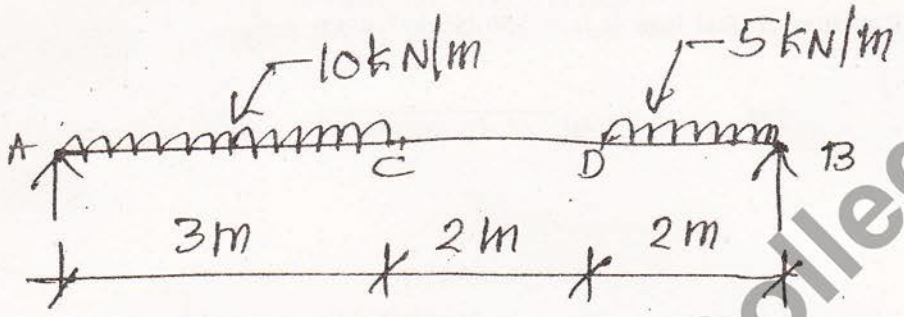
(b) Determine stresses arising in steel rails in summer at the temperature of 42° C, if the rails have been laid at 12°C without clearance in the winter. If the clearance 0.2 mm/metre left between rail, what will be stress in rail now ? 8

Marks

UNIT—III

VII (a) The maximum torque transmitted by shaft is 3157 Nm. If the allowable shear stress in the shaft is 45 N/mm², determine suitable diameter of shaft. 5

(b) Draw the SF and BM diagram for a simply supported beam as shown in figure. Find the maximum bending moment.

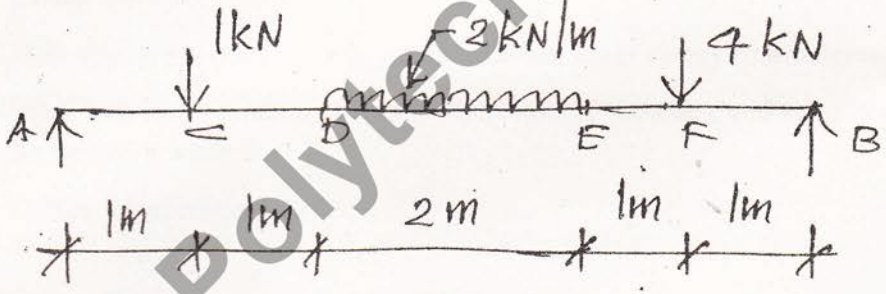


10

OR

VIII (a) A circular shaft 30 mm diameter is subjected to a torque of 0.60 KN-m. Determine the angle of twist over 1 m length of the shaft. Take $G = 0.80 \times 10^5$ N/mm². 5

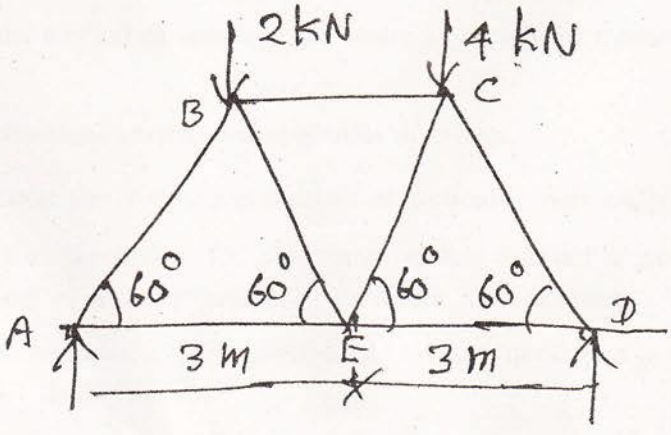
(b) Draw the SF and BM diagram for the beam as shown in figure.



Also determine the maximum bending moment. 10

UNIT—IV

IX Figure shows a warren girder consisting of seven members each of 3 m length, freely supported at its end points. Find the forces in all members indicating whether force is compressive or tensile. Use method of joints.



15

OR

Marks

X (a) Calculate hoop and longitudinal stresses in the material of a thin cylindrical shell 4 m diameter and 40 mm thick if subjected to internal pressure of 1N/mm^2. If the shell is built up with longitudinal and hoop joints whose efficiency are 70% and 60% respectively. 6

(b) A hollow cast iron column 400 mm external diameter and 300 mm internal diameter is used as column 4 m long with both end hinged. Determine the Rankines critical load if fc = 550 N/mm^2 and a $= \frac{1}{1600}$. 9
