I.D. No. 24476

B. Tech. 7th Semester F. Scheme Mechanical Engineering VII Examination, May–2014

STRENGTH OF MATERIAL–II

Paper–ME– 401-F

Time allowed : 3 hours]   *[Maximum marks : 100*

Note : Q. No. 1 is compulsory. Attempt five questions in total, at least one from each section.

1. (a) Define the theory of elastic failure.   5

   (b) What is unsymmetrical bending ?   5

   (c) What is difference between thick cylinder and thin cylinder ?   5

   (d) Define the Maxwell's theorem.   5

Section–A

2. A trolly of weight 100 kN is descending a slope with a uniform velocity of 2m/sec at the end of a steel cable which is wound round a drum. When the length of the cable laid out is 600m, emergency brakes are suddenly applied and the wagon is brought to a halt. If the cross–sectional area of the cable is 659 cm and E = 200 GPa, find the stress developed in the cable, what would be the stress if the length of the cable laid out is 240m ?   20

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3. A bar 3m long, 3cm diameter hangs vertically and has a collar securely attached at the lower end. Find the maximum stress, induced, when.

   (a) Weight of 2500N falls 12.5 cm on the collar.

   (b) Weight of 25kN falls 1.25 cm on the collar. $E = 200$ GPa.

Section–B

4. A thin cg spherical shell 50 cm in diameter with a thickness 3 mm, is full of water at atmospheric pressure (0.1 mPa). Find the intensity of radial pressure exerted on the wall of the shell if 30 cc of water at atmospheric pressure is pumped into the shell. Find out the resulting hoop stress and change in the volume. If sphere of modulus of elasticity of shell is $E = 210$GPa. Poisson's ratio (V) = 0.33, and bulk modulus of water is 2.361 GPa. **20**

5. A cast iron pipe having an internal diameter of 30 cm has wall 6 mm thick and is closely wound with a single layer of steel wire 3mm diameter under a stress of $8mN/m^2$. Find out stresses in the pipe and the wire when Internal pressure in the pipe is 1 MPa. **20**

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Section–C

6. A high tensile steel tyre, 2 cm thick, is shrunk on a cast-iron rim having 48 cm outside diameter and 6 cm thick. Find out the inside diameter of the steel tyre to the nearest thousandth of a cm if, after shrinking on, the tyre exerts a radial pressure of 50MPa on the cast iron rim.   20

7. A gun metal cylinder 12cm external diameter and 7.995 cm internal diameter is forced onto a steel cylinder, 8 cm external diameter and 4 cm internal diameter calculate the maximum resulting stresses in the steel and gun metal. E steel = 200 GPa, E gun steel = 100 GPa. Poisson's ratio is 0.35 for both metals.   20

Section–D

8. A curved bar of rectangular section, initially unstressed is subjected to bending moment of 1500 N-m which tends to straighten the bar. The section is 4 cm wide by 5 cm deep in the plane of bending and the mean radius of curvature is 10cm. Find out the position of the neutral axis and the magnitudes of the greatest bending stress and draw a diagram to show approximately how the stress varies across the section.   20

9. A railway wagon weighing 65 kN and moving with a speed of 10 km/hr. is to be stopped by 4 buffer springs in which the maximum compression allowed is 20cm. Find out the No. of turns in each spring in which diameter of the wire is 2cm and that of the coil is 20 cm.

G = 84 GPa.

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