Register No.: [ ]

144

October 2023

Time – Three hours
(Maximum Marks: 100)

[N.B. 1. Answer all questions under Part-A. Each question carries 3 marks.

2. Answer all the questions either (A) or (B) in Part-B. Each question carries 14 marks.]

PART – A

1. Define brittleness and hardness.
2. Define co-efficient of friction.
3. Define proof resilience and modulus of resilience.
4. Write the classification of force system.
5. Define : Polar moment of inertia.
6. What is hoop stress?
7. Define pure torsion and torsional rigidity.
8. State the advantages of springs used in automobiles.
9. What is meant by beam?
10. Define section modulus and bending stress.

PART – B

11. (a) Explain tensile test of mild steel in UTM with the help of stress strain diagram.

(Or)

(b) List out the defects in steel. Briefly explain any seven.

12. (a) A steel bar 400mm long, 60mm wide and 15mm thick is subjected to an axial tension of 100 kN. Calculate the final dimensions and change in volume of the bar. Take $E=2X10^5$ N/mm^2 and 1/m=0.3.

(Or)

[Turn over.....

(b) A metal bar 50mm X 50mm section is subjected to an axial compressive load of 600 kN. The contraction of 200mm gauge length is found to be 0.5mm and increase in side is 0.04mm. Find the values of E and 1/m.

13. (a) Find the moment of inertia about the centroidal co-ordinate axis of an I - Section having equal flanges 150mm X 10mm thick size and web 150mm X 10mm thick.

(Or)

(b) A channel section is of size 300mm x 100mm overall. The bases as well as the flanges of the channel are 10mm thick. Determine the values of I_{xx} and I_{yy}.

14. (a) A hollow shaft of 300 mm outer diameter and 250 mm inner diameter runs at 120 rpm, the maximum torque exceeds the mean by 30% and the maximum permitted shear stress is 60 N/mm^2. Calculate the power transmitted and angle of twist, if the length of the shaft is 3m. Take C = 9×10^4 N/mm^2.

(Or)

(b) A closely coiled helical spring has to absorb 5 Nm of energy when compressed by 50mm; the coil is 10 times the wire diameter. If number of coils is 10, determine the diameter of the wire and the coil. Also find the maximum shear stress produced if C = 0.8×10^5 N/mm^2.

15. (a) A cantilever beam of length 10m carries point loads of 3 kN, 6 kN, 4 kN and 5 kN at a distance of 3m, 6m, 8m and 10m respectively from fixed end. Draw SFD and BMD.

(Or)

(b) A timber joist of 5m span has to carry a load of 10 kN/m. Find the dimensions of the joist, if the maximum permissible stress is limited to 10 N/mm^2. The depth of the joist has to be twice the width.
