Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 18

B.Tech.(Automation & Robotics) (2018 Batch)   (Sem.–3)
STRENGTH OF MATERIALS
Subject Code : BTAR-302-18
M.Code : 76501

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Write briefly :

1. Distinguish between longitudinal and transverse strain.

2. Define modulus of rigidity and bulk modulus.

3. Give the classification of beams.

4. Define point of contraflexure.

5. Distinguish between moment of inertia and polar moment of inertia.

6. Define bending stress and write its units.

7. Define stiffness of close coiled helical spring and write its formula.

8. Distinguish between thin and thick cylinders.

9. Write the formula to find power transmitted by shaft.

10. What do you mean by build up cylindrical shells?

SECTION-B

11. A square steel rod 20 mm × 20 mm in section is to carry an axial compressive load of 100 kN. Calculate the shortening in a length of 50 mm. $E = 2.14 \times 10^6 \text{ kN/m}^2$.

12. Explain the procedure to construct Mohr's circle for a body subjected to two perpendicular direct stresses.

13. A simply supported beam of 10 m span carries the concentrated loads of 4 kN, 5 kN and 3 kN at distances 3, 7 and 11m respectively from one end. Draw shearing force and bending moment diagrams.

14. A timber beam 150 mm × 250 mm in cross-section is simply supported at its ends and has a span of 3.5 m. The maximum safe allowable stress in bending is 7500 k N/m². Find the maximum safe uniformly distributed load which the beam can carry. What is the maximum shear stress in the beam for the UDL calculated?

15. A simply supported beam is having length L and it carries a point load W at its mid span. Derive the formulae to find maximum deflection and maximum slope using double integration method.

SECTION-C

16. A hollow shaft, having an inside diameter 60% of its outer diameter is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in material, if the material to be used is also the same.

17. A boiler shell is to be made of 15 mm thick plate having tensile stress of 120 M N/m². If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively, determine :

    a) Maximum permissible diameter of the shell for an internal pressure of 2 M N/m², and

    b) Permissible intensity of internal pressure when the shell diameter is 1.5 m.

18. a) Explain theorem of perpendicular axes to find moment of inertia.

    b) Write a note on Maxwell's reciprocal theorem.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.