



ME 301 (AE 301/CE 301/EE 304)

**III Semester Diploma (Mechanical/Automobile/Civil/Electrical) Examination,
February 2011
ENGINEERING MECHANICS**

Time : 3 Hours

Max. Marks : 75

Instructions : 1) Answer *all* questions in Part – A and either (a) or (b) of each question in Part – B.
2) *Each* question carries 1 (one) mark in Part – A and 12 (twelve) marks in Part – B.

PART – A

1. Define Hardness. **(15×1=15)**
2. Define stress.
3. Define strain.
4. Define Centroid.
5. Define thin cylinder.
6. Define thick cylinder.
7. Define strength.
8. Define stiffness of beam.
9. Define neutral axis.
10. List the different types of springs.

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11. What is open coil spring ?
12. Define torsion.
13. Define beam.
14. What is meant by friction ?
15. List the types of gear.

PART – B

16. a) State and explain the different types of stresses. (12×5=60)

OR

- b) A circular bar of 20 mm diameter and 300 mm long carries a tensile load of 30 kN. Find the stress, strain and elongation of the bar.

Take $E = 2 \times 10^5 \text{ N/mm}^2$.

17. a) Determine the centroid of an angle section 100 mm × 80 mm × 20 mm thick with its longer arm being placed vertical.

OR

- b) Find the values of I_{xx} and I_{yy} of a T – section 120 mm wide and 120 mm deep overall. Both the web and flange are 10 mm thick.

18. a) A cantilever 2m long carries a point load of 3 kN at its free end and another Point load of 2 kN at a distance of 0.5 m from the free end. Draw the shear force and bending moment diagram.

OR

- b) A simply supported beam 5 m span carries a point load of 20 Kn at 2m from left support. Draw the shear force and bending moment diagrams.



19. a) A closely coiled helical spring of alloy steel wire of 10 mm diameter having 15 complete turns with the mean coil diameter as 10 mm. Calculate the stiffness of the spring. Take $N = 90 \times 10^3 \text{ N/mm}^2$.

OR

- b) A hollow shaft of external and internal diameter of 80 mm and 50 mm is required to transmit torque from one end to the other. What is the safe torque it can transmit, if the allowable shear stress is 45 N/mm^2 ?
20. a) In a spur gear arrangement, the driver has 100 teeth and of 25 mm pitch. Find the power transmitted by the gear, if the tangential force on the follower is 10 kN. Take the speed of driver as 300 rpm.

OR

- b) An engine shaft running at 120 rpm is required to drive a machine shaft by means of a belt. The pulley on the engine shaft is of 2 m diameter and that of the machine shaft is of 1 m. If the belt thickness is 5 mm, find the speed of the machine shaft when (i) there is no slip and (ii) there is a slip of 3%.
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