



KERALA AGRICULTURAL UNIVERSITY
B.Tech. (Agri. Engg.) 2019 Admission
I Semester Final Examination-January 2020

Iden.1101

Engineering Mechanics (2+1)

Marks: 50
Time: 2 hours

I State True or False

(10x1=10)

1. A beam extending beyond the supports is called overhanging beam.
2. The rate of change of displacement with time is called velocity.
3. Coefficient of friction depends upon nature of surface.
4. Dynamics deals with the forces required to produce motion.
5. B.M.is maximum where S.F is minimum.
6. One joule is equal to 15 N-m
7. A frame, in which all members lie in a single plane is called non planer
8. The tensile longitudinal stress produces compressive lateral strains
9. The deformation of a body is measured in terms of Unit strain
10. Maximum bending moment to the rupture the beam is called modulus of rupture

II Write Short notes on ANY FIVE of the following

(5x2=10)

1. A metal bar having rectangular cross section of 50 mm by 100 mm is 200 mm long. When the bar is subjected to an axial load of 70 kN it increases in length by 0.25 mm. What is Young's modulus? If the lateral dimension of 50 mm decreases by 0.018 mm, what is Poisson ration? Assume that the material is within limit of proportionality when the load of 70 kN is applied.
2. Draw neat sketches of shearing forces and bending moments in simply supported beams subjected to 4 point loads 'P' and their sign conventions.
3. Differentiate between failure stress and design stress.
4. Define simple tension and simple compression with the help of diagram only.
5. State the assumptions made in deriving torsional formula.
6. Draw a neat sketch of force component on the wire section of a helical spring subjected to axial load.
7. Draw a neat-labeled sketch of stress strain curve for ductile materials.

III Answer ANY FIVE of the following.

(5x4=20)

1. What do you mean by bulk modulus and hence derive an expression for it?
2. Explain parallel axis theorem or transfer formula related to centroid and moment of inertia.
3. Derive a relationship between shearing force and intensity of loading.
4. A beam is having a length of "L" between the supports and on both sides of supports it's having an overhang of "a". At the end of the beam it's subjected to a load of "P" on both sides. Draw shear force diagram and bending moment diagram for an overhanging beam.
5. Discuss about buckling in beams.

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6. A hollow shaft has to transmit 5MW at 200 rpm. The outside diameter is 300 mm. calculate the inside diameter, if the allowable shear stress is 60 MPa.
7. A closed coil helical spring has mean diameter of 75 mm, has spring constant of 80 kN/m. It has 8 coils. What is the suitable diameter of the spring wire, if the maximum shear stress is not to exceed 250 MN/m²? Modulus of rigidity is 80 GN/m². What is the maximum axial load the spring can carry?

IV Write an essay on ANY ONE of the following

(1x10=10)

1. A beam is 5 m long and is simply supported. At one m from left its subjected to 40kN, at 3m from left its subjected to 20kN and at one m from right end its subjected to another 10 kN. Draw shear force diagram and bending moment diagram after its complete calculations.
2. Two shafts one hollow and other solid are to transmit same power at same speed. Maximum shear stresses in both are same. If lengths and materials are also same for both, then find an expression for ratio of their masses in terms of 'n' where 'n' is ratio of external to internal diameters of hollow shaft. What is the ratio of angles of twist in terms of 'n'?
