

# KERALA AGRICULTURAL UNIVERSITY

B.Tech (Agrl.Engg.) 2016 Admission  
1<sup>st</sup> Semester Final Examination-February-2017

Cat. No: Iden.1101.

Marks: 50.00

Title: Engineering Mechanics (2+1)

Time: 2 hours

## I. Fill up the blanks /State True or False

(10 x 1=10)

1. The forces which meet at one point, are known as -----
2. In a couple the line of action of the forces are -----
3. The Newton's second law of motion gives a relationship between forces, mass and -----
4. If a ladder is not in equilibrium against a smooth vertical wall, then it can be made in equilibrium by ----- the angle of inclination
5. The moment of inertia of a circular section of diameter (d) is given by the relation -----
6. Everybody has one and only one centre of gravity.(T/F)
7. A redundant frame is also called perfect frame. (T/F)
8. The ratio of lateral strain to the linear strain is called modulus of elasticity. (T/F)
9. The neutral axis of a section is an axis, at which the bending stress is zero. (T/F)
10. When a solid shaft is subject to torsion, the shear stress induced in the shaft at its centre is maximum. (T/F)

## II Write short notes/answers on any FIVE of the following

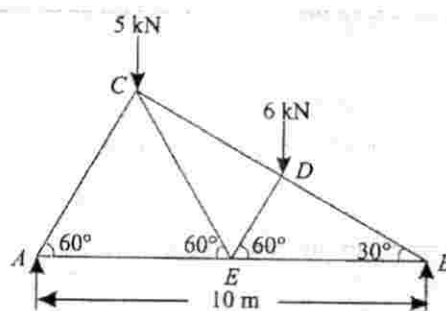
(5x2=10)

1. Varignon's theorem
2. Lami's theorem
3. Assumptions made, while finding out the forces in the various members of a framed structure
4. Find the centre of gravity of a T-section with flange 150 mm x 10 mm and web also 150 mm x 10mm
5. Assumptions made in the theory of simple bending
6. Relation for the torque and power, a solid shaft can transmit.
7. Types of springs and its uses.

## III Write short answers on any FIVE

(5x4=20)

1. State and prove the theorem of perpendicular axis applied to moment of inertia.
2. Derive from fundamental, the relation for the deformation of a body, when it is subjected to its own weight.
3. A truss of span 10 meters is loaded as shown in figure. Find the forces in all the members of the truss.



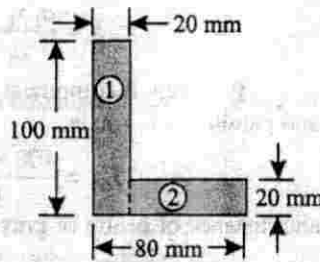
4. Derive an expression for the stresses on an oblique section of a rectangular body, when it is subjected to direct stresses in two mutually perpendicular directions.

5. A cantilever beam 2 m long carries a point load of 1.8 kN at its free end. Draw shear force and bending moment diagrams for the cantilever
6. At a point in a stresses element, the normal stresses in two mutually perpendicular directions are 45 MPa and 25 MPa both tensile. The complementary shear stress in these directions is 15 MPa. By using Mohr's circle method determine the maximum and minimum principal stresses
7. Derive an expression for the shear stress at any point in the cross-section of a beam

**IV Write essay on any ONE**

**(1x10=10)**

1. Find the moment of inertia about the centroidal x-x and y-y axes of the angle section shown in figure.



2. Prove the relations

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

Where: M= Bending moment, I= Moment of inertia,  $\sigma$ = Bending stress in a fibre, at a distance y from the neutral axis, E= Young's modulus and R= Radius of curvature.

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