KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2012 Admission

IVth Semester One time Special Re-Examination-June -2016

Cat. No: Cien. 2204 **Marks: 80.00**

Title: Mechanics and Strength of Materials (2+1) **Time: 3 hours**

I. Fill up the blanks **[10 x 1 = 10]**

1. Two equal unlike parallel forces whose lines of action are not the same, are said to form a .....
2. If n denotes the number of nodes, then the number of members in a perfect frame is .....
3. The centre of gravity of a solid cone lies on the axis at a height ..... of the total height above the base. (one-third, one-fourth, two-third)
4. The moment of inertia of a circular lamina about the diameter, d is .....
5. The coefficient of friction is the ..... of angle of friction.
6. ..... is the rate of doing work.

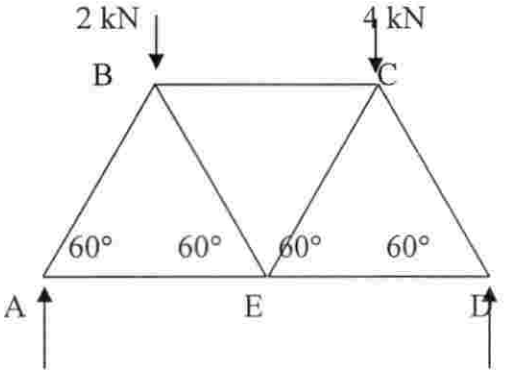
7. The resistance per unit area to deformation is called .....
8. The maximum strain energy which can be stored in a body is called .....
9. The plane which has no shear stress is called a .....
10. The load required to produce a unit deflection in a spring is called .....

II. Write short answers on <u>ANY TEN</u> **[10 x 3 = 30]**

1. Resultant of two forces acting at a point
2. Find the centre of gravity of a T-section with flange 150mm x 10mm and web 100 mm x 10 mm.
3. Define Hooke's law and Modulus of elasticity
4. Define Poisson's ratio and volumetric strain
5. Define Shear Force and Bending Moment
6. Define Work, Power and Energy
7. Differentiate between circumferential stress and longitudinal stress
8. Distinguish between column and strut
9. Distinguish between close coiled and open coiled spring
10. Mohr's circle and it's use
11. Bending stress and shearing stress
12. SFD and BMD of a simply supported beam with central point load.

III. Answer <u>ANY SIX</u> of the following **[6 x 5 = 30]**

1. A 13 m ladder weighing 250 N is placed along a smooth vertical wall with its lower end 5m from the wall. The coefficient of friction between the ladder and the floor is 0.3. Show that the ladder will remain in equilibrium in this position. What is the frictional force acting on the ladder at the point of contact between the ladder and floor? The centre of gravity of the ladder is at the mid-point of its length.
2. A simply supported beam AB of span 5 m is loaded with 3 kN, 4 kN and 5 kN weights at 2m, 3m and 4m respectively from the end A. Draw the SF and BM diagrams.
3. The forces 20 N, 30 N, 40 N, 50 N and 60 N are acting on one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force.
4. Figure shows a Warren girder consisting of seven members each of 3 m length freely supported at its end points. The girder is loaded at B and C as shown. Find the forces in all the members of the girder, indicating whether the force is compressive or tensile.



5. An aeroplane is moving horizontally at 108 km/h at an altitude of 1000 m towards a target on the ground which is intended to be bombed. Estimate where the bomb must be released in order to hit the target. Calculate also the velocity with which the bomb hits the target.

6. The stresses at a point in a component are 80MPa (tensile) and 40MPa (compressive). Determine the magnitude of the normal and shear stresses on a plane inclined at an angle of 30° with tensile stress, using Mohr's circle. Also determine the direction of the resultant stress and the magnitude of the maximum intensity of shear stress.
7. A particle is dropped from the top of a tower 60 m high and another particle is projected at the same time vertically upwards from the foot of the tower to meet the first particle at a height of 18m. Find the velocity of projection of the second particle.
8. An I section, with rectangular ends, has the following dimensions;
   flanges - 150mm x 20mm web - 300mm x 10 mm.
   Find the maximum shearing stress developed in the beam for a shearing force of 60 kN.

IV. **Answer <u>ANY ONE</u> of the following.** **[1 x 10 = 10]**

1. A cube of 60mm side is subjected to a force of 5 kN(Tension), 7 kN(compressive) and 4 kN(Tension) along x, y and z directions respectively. Determine the stresses and strains in x, y and z directions. Also find the change in volume of the block. Take E as 200 GPa and Poisson's ratio as (3/10).

2. A simply supported beam AB of span 6 metres is carrying a point load of 30 kN at a distance of 4 m from the left end A. Calculate the slopes at A and B and deflection under the load. Take EI = 26×10^{12} N.mm^2.