

KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2010 Admission
IVth Semester Final Examination- July -2013

Cat. No: Cien.2204

Title: Mechanics and strength of Materials (2+1)

Marks: 80

Time: 3 hours

I. Match the following

[10 x 1 = 10]

- | | |
|---------------------------|---------------------------------|
| 1. Stress | a. Columns |
| 2. Poisson's ratio | b. motion |
| 3. Macaulay's method | c. Shear stress/ Shear strain |
| 4. Modulus of rigidity | d. Deflection of beams |
| 5. D'Alembert's principle | e. Stress/Strain |
| 6. Couple | f. Lateral strain/Linear strain |
| 7. Mohr's circle | g. Hoop stress |
| 8. Rankine's formula | h. Principal stress |
| 9. Circumferential stress | i. Load/area |
| 10. modulus of elasticity | j. Equal unlike parallel forces |

II. Write short answers on ANY TEN

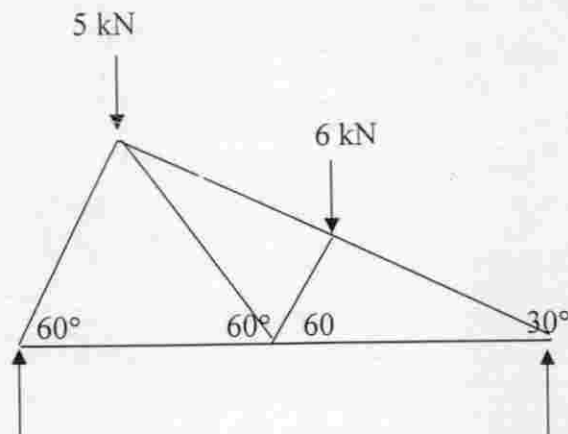
[10 x 3 = 30]

1. State the Newton's laws of motion.
2. Derive the equation for elongation in a bar due to its own weight.
3. Define resilience, proof resilience and modulus of resilience
4. Establish the relationship between SF and BM.
5. Differentiate between a closely coiled helical spring and an open coiled helical spring.
6. Distinguish between modulus of section and modulus of rigidity
7. Distinguish between Bulk Modulus and Young Modulus
8. Differentiate between circumferential stress and longitudinal stress.
9. Define Euler's Column theory. What are the four end conditions of columns?
10. Distinguish between a column and a strut.
11. Distinguish between perfect frame and statically determinate frame
12. Define principal plane and principal stress

III. Answer ANY SIX of the following

[6 x 5 = 30]

1. State and prove Lami's theorem.
2. Prove $E = 3K(1-2/m)$ if E = modulus of elasticity, K = Bulk modulus and $1/m$ is the Poisson's ratio.
3. Derive the equation for the path of a projectile.
4. A truss of span 10 m is loaded as shown in the figure. Find the reactions and forces in the members of the truss.



5. A simply supported beam (ABC) of length 10m, carries a uniformly distributed load of 2 kN/m for AB portion. If AB = 5m, draw the shear force and bending moment diagrams.
6. Show that for a rectangular section the ratio of maximum shear stress to the average shear stress is 1.5.
7. An I section joist 300mm x 100mm x 20 mm is used as a strut with both ends fixed. What is the Euler's crippling load for the strut? Take Young's modulus for the joist as 200 GPa.
8. A cylindrical shell of 1.5 m diameter is made up of 10 mm thick plates. Find the circumferential and longitudinal stress in the plates, if the boiler is subjected to an internal pressure of 2.5 MPa. Take efficiency of the joints as 80%.

IV. Answer ANY ONE of the following.

[1 x 10 = 10]

1. An I section has the following dimensions;
top flange : 6cm x 1 cm, web : 10cm x 1cm, bottom flange: 12cm x 1cm
Find the moment of Inertia about the horizontal axis through the centre of gravity of the section.
2. A simply supported beam AB, 10m long carries three loads 2 kN, 3kN and 4kN at 3m, 6m and 8m from end A. Find the reactions at the ends and draw the shear force and bending moment diagrams. Also locate the point of maximum bending moment.