Register Number: ……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2012

Third Semester

AERONAUTICAL ENGINEERING

MEC 109: STRENGTH OF MATERIALS

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Strain in a direction at right angles to the direction of applied force is known as
   a) Shear strain b) Lateral strain
   c) Volumetric strain d) None of the above
2. When a material retains its original position after removing the load it is named as
   a) elasticity b) Plasticity
   c) ductility d) Resilience
3. If plane of loading does not pass through one of principal centroidal axes of the cross section of the beam, the beam is said to be
   a) plane b) Oblique
   c) Both (a) and (b) d) None of the above
4. The point of contraflexure is also called
   a) The point of inflexion b) A virtual hinge
   c) Both (a) and (b) d) None of the above
5. The amount of deflection of a beam subjected to a typical loading depends upon
   a) Cross section b) Bending moment
   c) both (a) and (b) d) None of the above
6. Which of the following statements is incorrect?
   a) Stress is directly proportional to strain within elastic limit b) The stress is force per unit area
   c) Hooke's law holds good up to the breaking point d) The ratio of linear stress to linear strain is called Young's modulus
7. The angle of twist is _____ proportional to the twisting moment.
   a) Directly b) Indirectly
   c) both (a) and (b) d) None of the above
8. For a given same material, length and torque a hollow shaft weighs _____ a solid shaft.
   a) Less than b) More than
   c) Equal to d) None of the above

9. In case of a laminated spring, the load at which the plates become straight is called

a) Working load b) Safe load

c) Proof load d) Maximum load

10. There is always a limiting value of load up to which the strain totally disappears on the removal of load; the stress corresponding to this load is

a) Elastic limit b) Unit stress

c) Yield stress d) None of the above

PART B (10 x 2 = 20 Marks)

11. State Hookes Law?
12. Define: Bulk Modulus?
13. What are the types of beam?
14. Define: i) shear force ii) bending moment
15. What is pure bending?
16. Draw conjugate beam for a cantilever carrying uniformly distributed load over the entire span.
17. What are the effects of torsion?
18. Define: Torsional rigidity?
19. Define: Principal stress and principal plane?
20. What is Mohrs circle?

PART C (5 x 14 = 70 Marks)

21. a) A circular bar 40 mm diameter carries an axial tensile load of 105 kN. What is the Value of shear stress on the planes on which the normal stress has a value of 50 MN/m^2 tensile?

(OR)

b) A steel tie rod 50mm in diameter and 2.5 m long is subjected to a pull of 100kN. To what length the rod should be bored centrally so that the total extension will increase by 15 percent under the same pull, the bore being 25 mm diameter? Take E = 200 GN/m^2 .

22. a) A beam AB 10m long has supports at its ends A and B. It carries a point load of 2.5 KN at 3 m from A and a point load of 2.5 KN at 7m from A and UDL of 0.5 KN/m between the point loads. Draw shearing force and Banding Moment Diagram. And also find Maximum bending moment.

(OR)

b) A simply supported beam of length 12m carries a uniformly Distributed Load of 25KN/m. Draw the S.F and B.M diagram for the beam. Also calculate the position and magnitude of maximum bending moment.

23. a) A hollow circular shaft 20mm thick transmits 294 kW at 200 rpm. Determine the diameter of the shaft if shear strain due to torsion is not to exceed $8.6x10^{-4.}$ Take $C = 80GN/m^2$

(OR)

b) Write down the procedure of Double Integration Method.

24. a) A Beam with a span of 4.5 m carries a point load of 30kN at 3 m from the left support. If for the section, $I_{xx} = 54.97 \times 10^{-6}$ m^4 and $E = 200$ GN/m^2, find

i) The deflection under the load.

ii) The position and amount of maximum deflection.

(OR)

b) A close coil helical spring is required to carry a load of 150 N. If the mean coil diameter is to be 8 times that of the wire, calculate the diameter of the wire. Take maximum shear stress as 100 MPa.

25. a) Derive an expression for Longitudinal Stresses of thin walled circular cylinder

(OR)

b) For a given loading conditions the state of stress on the surface of a cylinder is expressed as follows:

(a) . 85 MN/m^2 tensile (b). 25 MN/m^2 tensile at right angles to (a)

(c). Shear stresses of 60 MN/m^2 on the planes on which the stresses (a) and (b) act; the sheer couple acting on planes carrying the 25 MN/m^2 stress is clockwise in effect. Calculate the principal stresses and the planes on which they act. What would be the effect on these results if owing to a change of loading (a) becomes compressive while stresses (b) and (c) remain unchanged?

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