

**B.E. DEGREE EXAMINATIONS: APRIL / MAY 2010**

Fourth Semester

**AERONAUTICAL ENGINEERING**

U07AR403: Aircraft Structures I

**Time: Three Hours**

**Maximum Marks: 100**

**Answer ALL the Questions:-**

**PART A (10 x 1 = 10 Marks)**

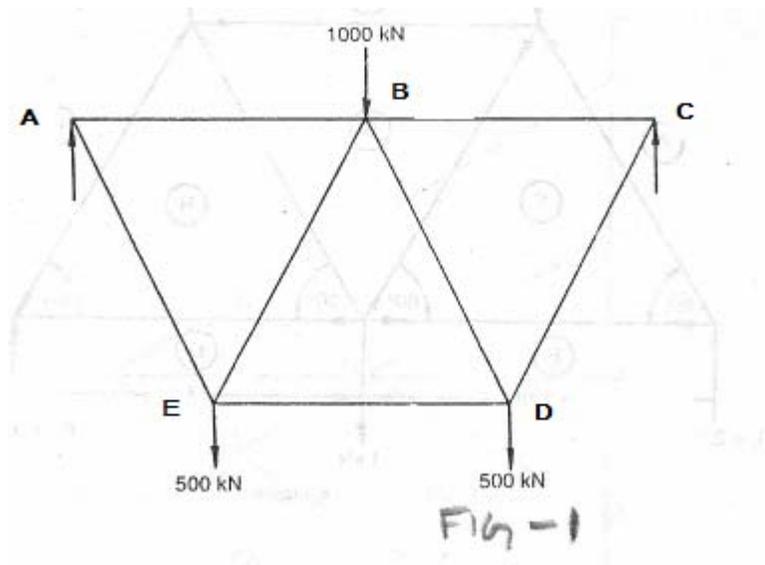
- 1) Resistance to Deformation is called
  - a) Safety
  - b) Stiffness
  - c) Strength
  - d) Fatigue
- 2) The support at which the beam is free to rotate about hinge and also translational displacement along the plane of rolling
  - a) Roller
  - b) Fixed
  - c) Free
  - d) Either (a) or (c)
- 3) A beam which has more than two supports (OR) more than one span are considered as
  - a) Fixed beam
  - b) Continuous beam
  - c) Fixed simple beam
  - d) Simple beam
- 4) The product of EI is called
  - a) Factor of safety
  - b) Stiffness factor
  - c) Flexural rigidity
  - d) Distribution Factor
- 5) The internal energy stored by the material during deformation in loading process is called
  - a) Strain energy density
  - b) Strain energy
  - c) Work done
  - d) Inelastic strain energy
- 6) Castiglianos Theorem is based on
  - a) Strain energy
  - b) Principle of Least work
  - c) Principle of Stationary total potential energy
  - d) Minimum potential energy theory
- 7) Secondary bending moments are produced by
  - a) Axial load
  - b) Compression load
  - c) Transverse load
  - d) Both axial and compression load
- 8) The member which carries compressive load is called
  - a) Strut
  - b) Post
  - c) Column
  - d) Web
- 9) Maximum shear stress theory was postulated by
  - a) St. Venant
  - b) Mohr
  - c) Rankine
  - d) Tresca
- 10) Maximum principle stress theory was postulated by
  - a) St. Venant
  - b) Mohr
  - c) Rankine
  - d) Tresca

**PART B (10 x 2 = 20 Marks)**

- 11) Define a Fixed Beam
- 12) State the assumption made in finding the member force in truss.
- 13) State the Castigliano's theorems.
- 14) Write the Clapeyron's three-moment equation in general form and explain the terms?
- 15) Give expression for strain energy in (a) Tension and (b) Bending.
- 16) Define carry over factor.
- 17) Define Euler Column.
- 18) Define resilience and proof resilience
- 19) Clearly explain the octahedral shear stress theory.
- 20) State maximum shear stress theory.

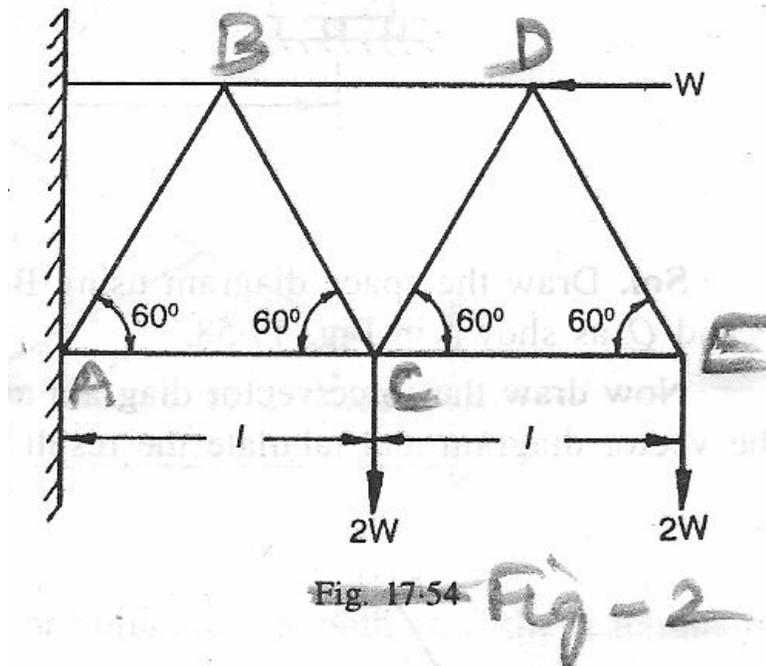
**PART C (5 x 14 = 70 Marks)**

- 21 a) A truss is loaded as shown in Fig 1. Find the forces in the members of the truss shown in Fig1



(OR)

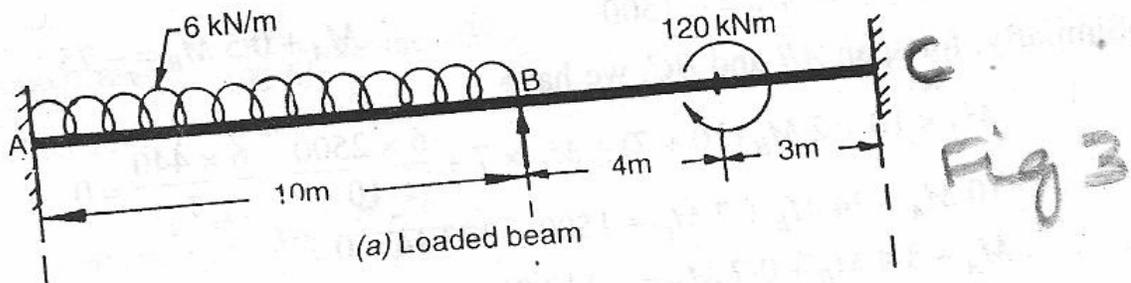
b) A truss is loaded as shown in Fig 2. Find the forces in members of the truss shown in Fig2



22 a) State and prove Clapeyron's Three moment equation.

(OR)

b) A two span continuous beam ABC fixed at the ends is loaded as shown in fig 3. Find bending moment and reaction at the supports.



- 23 a) For the truss shown in the fig 4 the cross section area of the bars in compression are  $30\text{cm}^2$  and others  $12\text{cm}^2$ . determine the vertical displacement of point C and horizontal displacement of point B. Given  $E=210\text{Gpa}$ .

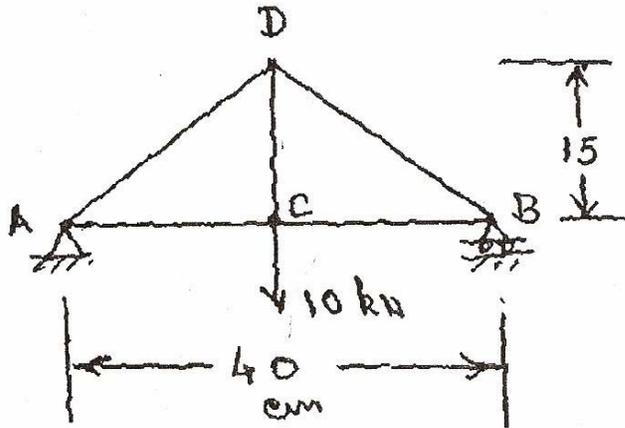


Fig 4

(OR)

- b) State and prove Castiglianos Theorem.

- 24 a) Short notes on:

- i) Classification of columns.                      ii) Rankine's Hypothesis.

(OR)

- b) A bar of length 4m when used as a simply supported beam and subjected to a UDL of  $30\text{kN/m}$  over the whole span, deflects  $15\text{mm}$  at the centre. Determine the crippling loads when it is used as a column with following end condition:

- i) Both ends pin jointed                      ii) One end fixed and other end hinged and  
iii) Both ends fixed

- 25 a) What do you mean by failure theory .Explain any two theories briefly.

(OR)

- b) In a metallic body the principal stresses are  $35\text{MN/m}^2$  and  $-95\text{MN/m}^2$ , the third principal stress being zero. The elastic limit stress in simple tension as well as in simple compression is equal and  $220\text{MN/m}^2$ . Find the factor of safety based on the elastic limit if the criterion of failure for the material is the maximum principal stress theory.

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