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JAYA GROUPS OF INSTITUTION

4th Sem B.E/B.TECH

INTERNAL ASSESMENT I (MODEL EXAMINATION-I)

Sub. Name	: **SOLID MECHANICS**	Date	: **28-02-2015**
Sub. Code	: **CE 6452**	Branch	: **TEXTILE ENGG.**
Duration	: **180 Minutes**	Marks	: **100**

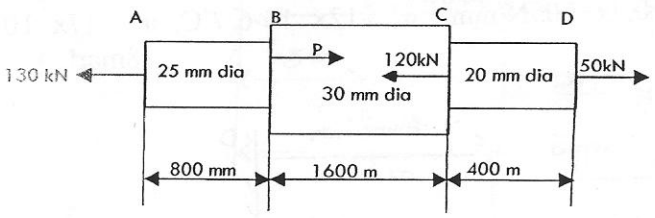
PART A (10*2=20) Answer All Questions

1. What is rigid body?
2. What is elastic limit?
3. State Hooke's law and modulus of elasticity
4. Write the relationship between Young's modulus, Bulk modulus and Modulus of rigidity.
5. Define Poisson's ratio.
6. Define Beam. Classify the beams according to its supports.
7. What is meant by transverse loading on beams? What are the types of transverse load?
8. What is mean by hogging bending moment?
9. When will the bending moment be maximum? Define the term Point of Contraflexture.
10. Draw the SF and BM diagram for a cantilever beam of span 'L' carrying a point load 'w' at a distance of 'a 'from free end.

PART B (5*16=80) Answer All Questions

11.a) i) A steel rod 20 mm diameter is enclosed centrally in a hollow copper tube of external diameter 30mm and internal diameter 25mm. The composite bar is then subjected to an axial pull of 40 KN. Find the stresses in the rod and tube. Take Es =200 KN/mm2 and Ec =100 KN/mm^2. (8marks)

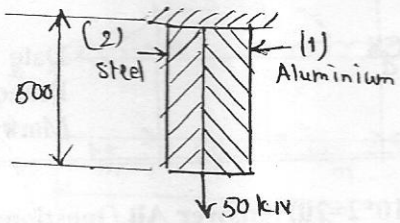
ii) Find the value of P and the change in length of each component and the total change in length of bar shown in Figure given below:



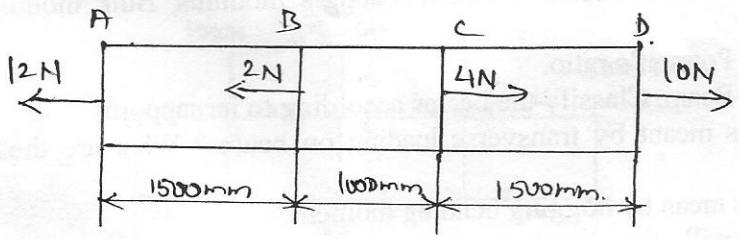
(8marks)

OR

11.b)i) A compound bar of length 500mm consists of a strip of aluminium 40mm wide x 15 mm thick and a strip of steel 40mm wide x 10mm thick rigidly joined at ends. If the bar is subjected to a load of 50 KN, find the stress developed in each material and the extension of the bar. Take modulus of elasticity of aluminium and steel as $1.1x10^5$N/mm2 and $2.1x10^5$N/mm2. (8marks)



ii) A steel rod of 50mm diameter is subjected to a force as shown in given figure. Find the elongation of the rod. Take E= 2x 105N/mm2. (8marks)

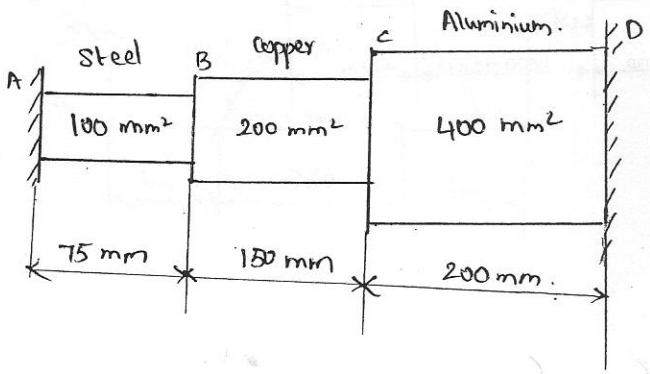


12.a)i) A gun metal rod 25mm diameter screwed at the end passes through a steel tube 30mm and 35mm internal and external diameters. The temperature of the whole assembly is raised to 125°C and the nuts on the rod are then screwed tightly on the ends of the tube. Calculate the stresses developed in gunmetal and steel tube when the temperature of the assembly as fallen to 20°C. (10 marks)

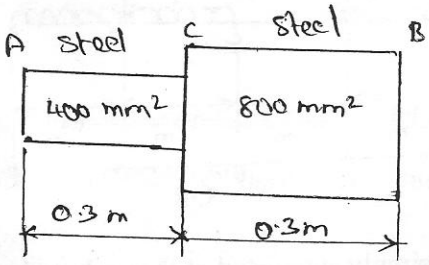
ii) A rod of 1.5m long, 10mm diameter is fixed at the ends and subjected to axial pull of 8 KN. Find the residual stress due to increase in temperature of 25°C. (6 marks)

OR

12.b)i) A rod is made of brass, copper and aluminium as shown in figure below, is held between two rigid supports at A and D. Calculate the stresses developed in each material when the temperature of the system is raised by 40°C. Take Es = 2.1x 105N/mm^2 , Ec = 1.1x 105N/mm^2, E_a = 0.7x 105N/mm^2, α_s =12x 10-6 /°C, α_c =17x 10^{-6} /°C, α_a = 21x 10^{-6} /°C. (8marks)

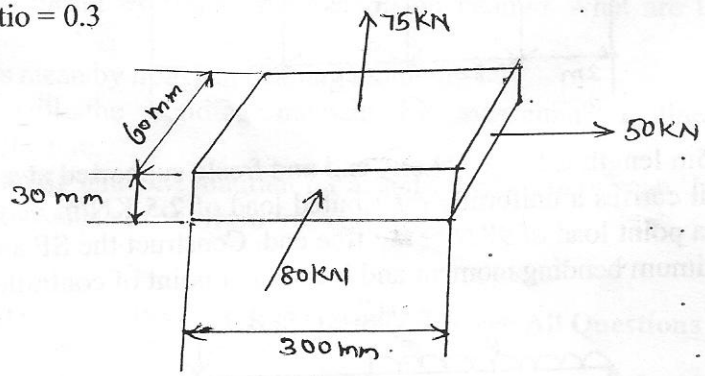


ii) Calculate the values of stress and strain in portion AC and CB of the steel bar shown in figure below. A close fit exsits at both of the rigid supports at room temperature and the temperature is raised by 75°C. Take E = 200 GPa and $\alpha = 12 \times 10^{-6}$ /°C for steel. Area of cross section of AC is 400 mm^2 and of BC is 800 mm^2. (8marks)



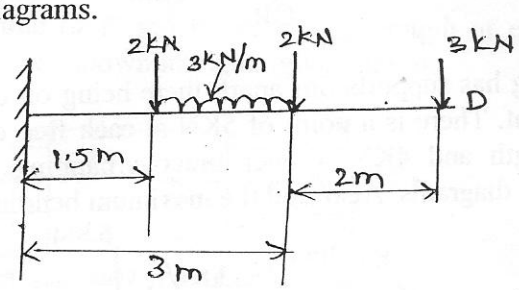
13.a)i) A bar of 20mm diameter is tested in tension . It is observed that when a load of 40 KN is applied, the extension measured over a gauge length of 20mm is 0.12 mm and contraction in diameter is 0.0036 mm. Find Poisson's ratio and elastic constants E, G and K. (8marks)

ii) A steel plate of 300mm long, 60mm wide and 30mm deep is acted upon by the forces shown in figure below. Determine the change in volume. Take E = 200kN/mm^2 and poisson ratio = 0.3 (8marks)



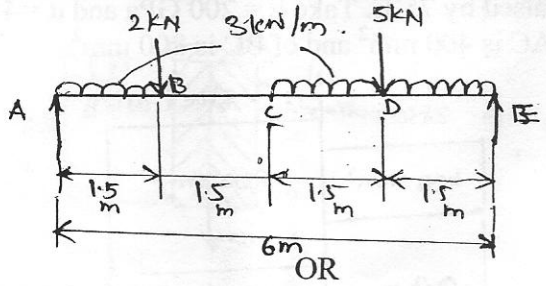
OR

13.b)i) A cantilever beam of length 5m is loaded as shown in figure given below. Draw the SF and BM diagrams. (8marks)



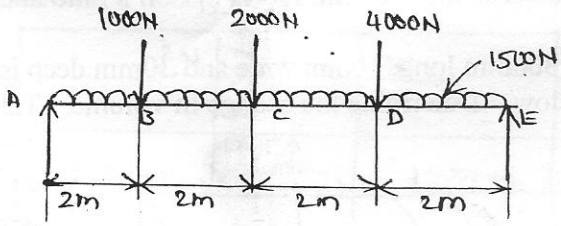
ii) Draw the shear force and bending moment diagram for a cantilever beam carrying load whose intensity varies uniformly from zero at the free end to ' W' per unit run at the fixed end. (8marks)

14.a)A beam freely supported over a span of 6m, It carries a UDL of 3 KN/m over 1.5m from the left hand support also from the centre upto the right hand support. It has, besides, two point loads of 2 an 5KN at 1.5 and 4.5 from left hand support. Construct the SF and BM diagrams. Also find the point and value of maximum bending moment. (16marks)

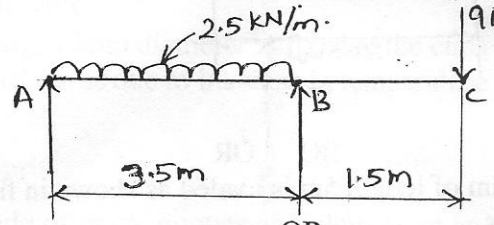


OR

14.b) A beam 8m long is simply supported at the ends and carries a uniformly distributed load of 1500 N/m and three concentrated load of 1000N, 2000N and 4000N acting respectively at the left quarter point, centre point and right quarter point. Draw SFD and BMD. (16 marks).



15.a)A beam of 5m length is hinged at one end and freely supported at a distance of 3.5m from the hinge. It carries a uniformly distributed load of 2.5 KN/m between hinged end and support and a point load of 9KN at the free end. Construct the SF and BM diagrams. Find out the maximum bending moment and location of point of contraflexture. (16 marks).



OR

15.b) A beam 7.5m long has supports 5m apart, there being on overhang of 1m on the left and 1.5m on the right. There is a point of 5KN at each free end, a UDL of 8KN/m over the supported length and 4KN/m over the overhanging portion on the right. Construct the SF and BM diagrams. Also find the maximum bending moment. (16 marks).