Code No. 6022

FACULTY OF ENGINEERING

B.E. 2/4 (Mech. / Prod./AE) I-Semester (Main) Examination, November 2013

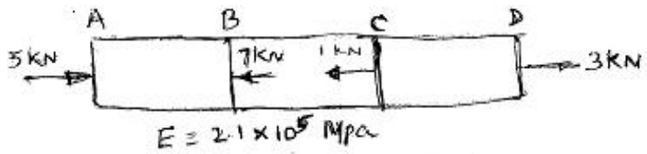
Subject : Mechanics of Materials

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1.



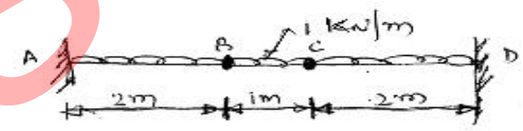
The change in the length of the position BC in figure 1 is
(a) 10mm (b) 12mm (c) 12.4mm (d) none of these (3)

2. Write the relationship between bending moment, shear force and rate of loading. (3)
3. Write the difference between close coiled, open coiled and laminated springs. (3)
4. Draw shear stress distribution for rectangular I and T-section. (3)
5. Define effective length of a column and slenderness ratio. (3)
6. What is the difference between plasticity and elasticity? (2)
7. Define pure bending with an example. (2)
8. Write the formula for equivalent bending moment. (2)
9. Define principal planes. (2)
10. Differentiate between tie and struct. (2)

PART – B (50 Marks)

11. A weight of 200 kN is supported by three short pillars, each 50mm^2 in section. The centre pillar is of steel and the outer ones are of copper. The pillars are so adjusted that at a temperature of 15^{o}C each carries equal loads.
Find the stress in each pillar at 115^{o}C. E_S=0.200 MN/mm^2, E_c=0.080 MN/mm^2, α_s = 12x10^{-6} / ^{o}C, α_c = 18.5 x 10^{-6} / ^{o}C. (10)

12. Draw S.F and B.M diagrams for the beam loaded as shown in figure 2. At B and C, there are internal hinges. (10)



13. A timber beam 20 x 30cm is reinforced by a steel plate 20cm wide and 1cm thick bolted to its bottom edge, giving a composition beam 20 x 31cm. Calculate the maximum stress in steel and timber when the composition beam is subjected to a B.M of 60 kN-M. E_s = 20 x E $_{timer}$. (10)

14. A girder rests on two supports 5m apart and carriers a load of 60kN, 2m from one support. Find the ratio of maximum reflection to deflection under load. (10)

15. A solid shaft of diameter D is subjected to anaxial thrust p and torque T. Show that the principal stresses at any point on the surface of the shaft are given by $\frac{2P}{ND^2}\left(1 \pm \frac{64T^2}{P^2D^2}\right)$ where N is rigidity modulus and D is diameter of shaft.

16. An R.s. joist 55 cm by 19cm having flange and web thickness 1.5cm and 0.99cm respectively is used as a on beam. If at a section, it is subjected to shear force of 100 kN, taking (a) Web vertical (b) Web horizontal. Showing variation of shear stress in both cases.

17. (a) What are the limitations of Euler's formula. (3)
(b) A straight circular bar of steel one cm in diameter and 120cm long is mounted in testing machine and loaded axially in compression till it buckles. Assuming the Euler formula for pinned ends to apply, estimate the maximum central deflection before the material reaches its yield stress of 350 N/mm^2 E = 0.21 x 10^5 mpa.

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