Code No. : **5337/N**

FACULTY OF ENGINEERING

B.E. 2/4 (Mech./Prod.) I Semester (New) (Main) Examination, December 2011
MECHANICS OF MATERIALS

Time: 3 Hours]   [Max. Marks: 75

Note : *Answer **all** questions of Part **A**.*
*Answer **five** questions from Part **B**.*

PART – A   (25 Marks)

1. Give relationship between three elastic constants.   2

2. What are the assumptions made in Euler's Bernaulis theory of bending ?   2

3. Define stiffness of spring and spring index.   2

4. Differentiate between normal strain and shear strain.   2

5. What is Mohe's circle of stress ?   2

6. Differentiate between thin and thick cylinder.   3

7. Write Secant and Perry's formula for long column.   3

8. Obtain the relationship between moment of resistance and deflection from the
   fundamentals.   3

9. Define principal stresses and principal planes and explain their uses.   3

10. Define modular ratio, Poisson ratio and aspect ratio.   3

PART – B   (50 Marks)

11. The bar shown in fig. 1. is subjected to a tensile load of 100 kN. If the stress in the middle
    portion is limited to 150N/mm^2. Determine the diameter of the middle portion. Find also
    the length of middle portion if the total elongation of the beam is 0.2 mm. Take
    $E = 2.1 \times 10^5$ N/mm^2.

100×10^3 N ← [50mm∅] — d — [50mm∅] → 100×10^3 N
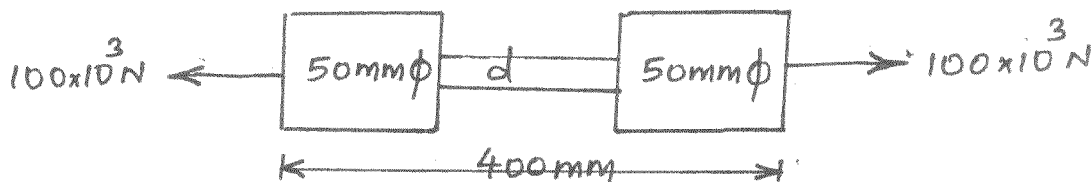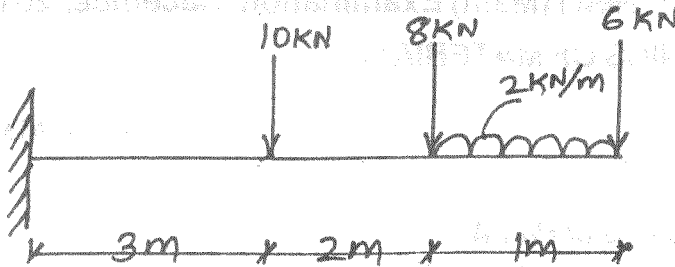
|← 400mm →|

Fig. 1

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12. Sketch the SFD and BMD for the beam loaded as shown in fig.

13. A cantilever has a free length of 2.4 m it is of T-Section with flanges 12×2cm and web 24cm×1. The flange being in tension. What load can be applied at the ends of cantilever if the maximum permissible stress in compression is 45MPa. What is the corresponding maximum stress in Tension.

14. Derive the expression for maximum deflection of a simply supported beam when subjected to a central point load by double integration method.

15. At a point in a stressed material, the stress conditions are $\sigma_x = 234.6\,MPa$, $\sigma_y = 35.4\,MPa$, and $\tau_{xy} = 57.5\,MPa$. Determine

    a) Normal tangential and resultant stresses on a oblique plane inclined at 20° to the vertical.

    b) Principal planes and principal stresses.

16. a) Classify springs and explain their applications.   4

    b) Derive the Lamee's equation for thick cylinders.   6

17. Determine the section of a cast iron hollow cylindrical column 6m long with end firmly built in, if it carries a axial load of 600 kN. The ratio of internal to external diameter is $\frac{3}{4}$ use factor of safety as 6. Take $f_c = 567\,MPa$, Rankine's constant $a = \frac{1}{1600}$.