(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1239 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2013-14

MECHANICS OF SOLIDS

Time : 3 Hours *Total Marks : 100*

Note :–Attempt **all** the Sections.

SECTION–A

1. Attempt **all** parts. Write in brief : **(2×10=20)**

   (a) Draw the stress – strain diagram for ductile and brittle materials.

   (b) Write down the generalized Hook's Law.

   (c) Write short notes on the classification of beams.

   (d) A cantilever beam with uniformly distributed load over the whole span, find out the slope and deflection of the beam at the free end.

   (e) A solid shaft is 100 mm in diameter. It transmits 120 KW at 200 rpm. Find the maximum transmit torque.

   (f) If two springs of stiffness k are connected in series, find the equivalent stiffness of the spring.

   (g) Write the formula of volumetric strain in the thin shells due to the stresses generated in the shells.

(h) An 800 mm diameter pipe contains a fluid at a pressure of 30 N/mm². If the safe stress in tension is 120 N/mm². Find the thickness of the pipe.

(i) Write down the assumptions of the theory for curved beam.

(j) What is the principal planes and principal stress ?

SECTION–B

2. Attempt any **six** parts of the following : **(5×6=30)**

(a) A steel bar of 25 mm diameter is acted upon by forces shown in Fig. 1. Determine the total elongation of the bar. Take E = 200 kN/mm².

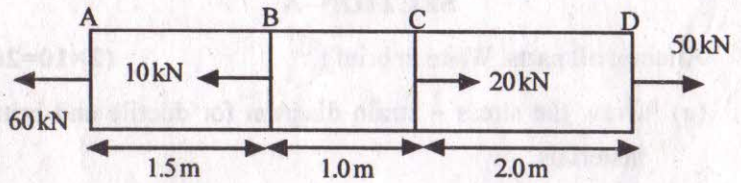

Fig. 1

(b) If a bar is stretched in such a manner that all the lateral strain is prevented, what is the value of the modified modulus of elasticity and modified Poisson's ratio ? Take μ as the Poisson's ratio.

(c) At a point in a block, the stresses on two mutually perpendicular planes are 40 N/mm² (tensile) and 20 N/mm² (tensile). The shear stress across these planes is 10 N/mm². Find using Mohr's stress circle, the magnitude and direction of the resultant stress on plane making an angle of 30° with the plane of the first stress.

(b) A leaf spring has 12 plates each 50 mm wide and 5 mm thick, the longest plate being 600 m long. The greatest bending stress is not to exceed 180 N/mm² and the central deflection is 15 mm. Estimate the magnitude of the greatest central load that can be applied to the spring. E = 0.206 × 10⁶ N/mm².

(c) Derive an expression for the buckling load of the columns/struts with one end fixed and other is hinged.