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# राष्ट्रीय प्रौधोगिकी संस्थान गोवा

# NATIONAL INSTITUTE OF TECHNOLOGY GOA

Farmagudi, Ponda, Goa, 403401

Programme Name: B.Tech, First Semester.

Mid Semester Examinations, February-2021

Course Name: Elements of Mechanical Engineering — Course Code: **ME150**

Date: 05th February 2021 — Time:09:30 AM-11:15 AM

Duration: 1 Hour 30 Minutes — Max. Marks: 50

ANSWER ALL QUESTIONS

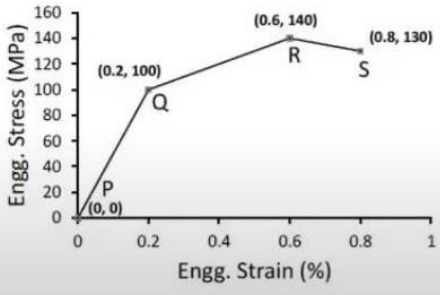
(1) How you differentiate the engineering vs. true stress-strain diagram. Derive the mathematical relation between them. Please explain each of the material properties obtained from engineering stress-strain diagram with clear plot. (**10 Marks**)

(2) Differentiate between the toughness vs. modulus of toughness, stretchiness vs. elasticity and hardness vs. strength of the metallic materials. (**10 Marks**)

(3) A 13 mm diameter tensile specimen has 50 mm gauge length. If the load corresponding to the 0.2% offset of 6800 kg the find out the yield strength of the material. Define stress & strain along with the physical significance of poisson's ratio. (**10 Marks**)

(4) (a) An alloy bar of 1 m length has square cross-section throughout which tapered from one end of 10 mm×10 mm to the other end 20 mm×20 mm. Find the deformation due to axial tensile load of 30 kN. Take modulus of elasticity as 120 GPa. (b) Find the toughness of the material from the below provided figure. (**10 Marks**)

A hypothetical engineering stress-strain curve shown in the figure has three straight lines PQ, QR, RS with coordinates P(0,0), Q(0.2,100), R(0.6,140) and S(0.8,130). 'Q' is the yield point, 'R' is the UTS point and 'S' the fracture point.




The toughness of the material (in MJ/m3) is _____

(5) Draw SFD and BMD for simply supported beam with concentrated moment at the mid span of the beam having length of 100 mm. Also obtain relation between shear force and bending moment. Write down the types of supports and their reaction forces. (**10 Marks**)