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FACULTY OF ENGINEERING

S.E (Mech/Prod) Year Examination - June – 2015

Strength of Materials

(Revised)

[Time: Three *Hours*] **[Max. Marks:80]**

"Please check whether you have got the right question paper."

i) Q.1 & Q.6 are compulsory

ii) Attempt any two questions each from the remaining questions of section A & section B respectively

iii) Assume suitable data if necessary & state it clearly.

SECTION-A

Q.1 Attempt any five 10

a) Give the relationship between Bulk Modulus and Young's modulus

b) What is the moment of inertia of a circular rod of diameter 'd' ?

c) Define lateral strain

d) Define Hardness & Brittleness

e) What is the maximum value of bending moment for a beam simply supported carrying an eccentric load?

f) Define moment of resistance

g) Define Bulk modulus

h) Define Rigidity modulus

i) What is principle of super position?

j) What is the ratio of maximum shear stress to the average shear stress in the case of solid circular section?

Q.2 a) Three planks of each $50mm \times 200\ mm$ timer are built up to a symmetrical I-section for a beam. The maximum shear force over the beam is 4KN. Propose an alternate rectangular section of the same material so that the maximum shear stress developed is same in both sections. Assume the width of the section to be 2/3 of the depth. 12

b) Calculate the increse in length of a steel bar, $100mm \times 12mm$ in cross section & 3m long. If subjected to an axial pull of 30 KN. Take modulus of elastcity of the steel as 210GPa. 03

Q.3 a) Draw the moment and load diagrams for a beam corresponding to the shear diagram shown in figure 1. 12

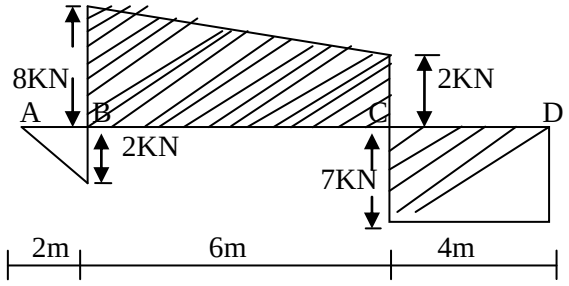

Figure1

b) Explain the stress strain curve for brittle material. 03

Q.4 a) Derive the bending moment equation. 12

b) Explain the equation for change in length of the member under the action of load. 03

Q.5 a) A rod is 2m long at a temperature of 10^0C. find the expansion of the rod when the temperature is raised to 80^0C. if this expansion is prevented , then find the stress in the material of the rod. Take E=100 GP_a and $\propto = 0.000012/\ ^0C$ 05

b) Draw the bending moment and shear force diagrams for the cantilever beam shown in figure 2. 10

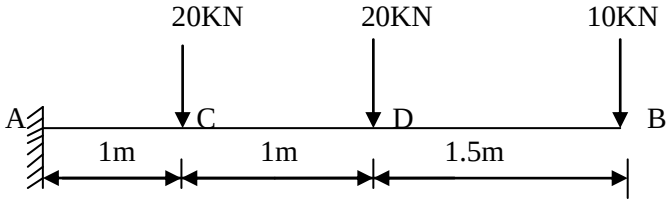

Figure 2.

SECTION-B

Q.6 Attempt any five 10

a) Define Kern of a section
b) Explain the difference between direct stress and bending stress
c) Define hoop stress & give its value for thin cylinder of diameter 'D'.
d) What is the value of modulus of section of hollow circular shaft?
e) Define complementary shear stress.
f) State the assumptions in the theory of torsion
g) State the general equation for deflection of a beam carrying imposed loads.
h) State the value of maximum deflection for a simply supported beam carrying uniformly distributed load over its entire span.
i) What is the slenderness ratio of a column hinged at both ends of length 'l' and least radious of gyration 'K'?
j) State the condition for no tension for a rectangular column ,carrying load an eccentricity 'e'

Q.7 a) A cylindrical shell is 3m long, 1 m in diameter & the thickness of metal is 10mm. it is subjected to an internal pressure of 150N/CM^2. Calculate the change in diamentions of the shell and the maximum intensity of shear stress induced. Given E= 200 GPa and poisson's ratio =0.3. 10

b) Calculate the maximum intensity of shear stress induced in solid shaftof 100mm diameter, 10m long. Transmitting 112.5KW power at 150 rpm. Take G=82 KN/MM2 05

Q.8 Determine the expression for normal and tangential stresses on a plane at θ to the plane of stress in x-direction in a general two dimensional stress system and show that 15

a) Sum of normal stresses in any two mutually perpendicular directions is constant.
b) Principal planes are planes of maximum normal stresses also.

Q.9 a) Determine by Macaulay's method, the deflection at P & Q in the beam shown in figure 3. 12
Take E=200 GPa & I=$20 \times 10^7 mm^4$

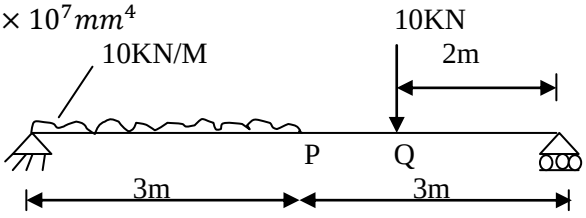

Figure 3

b) Explain Mohr's circle method of finding stresses. 03

Q.10 Write short notes on 15

i) Strain energy
ii) Stresses in thin cylinders
iii) Macaulay's method for finding deflection.