Registration No: | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PCI3G001

3rd Semester Regular Examination 2017-18
MECHANICS OF SOLID
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 100
Q.CODE : B1231

Answer Question No.1 and 2 which are compulsory and any four from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions: multiple type or dash fill up type :** **(2 x 10)**

a) The energy stored in a body when strained within elastic limit is known as……
b) Hook's law holds good upto……..
c) Bulk modulus is the ration of ……..and ……..
d) When shear force at a point is zero, then bending moment is …… at that point.
e) The maximum BM when the point load act at the middle of SSB is ……...
f) Neutral axis in simple bending is……..
g) Polar moment of inertia of circular cross section of shaft (of diameter d) is ……..
h) Buckling load for fixed-fixed column is ……
i) Maximum normal stress theory is used for …….material.
j) Poissin's ratio is the rario of …….……and ……..

Q2 **Answer the following questions: Short answer type :** **(2 x 10)**

a) How is thermal stress different from ordinary stress?
b) What are principal planes and principal stresses?
c) Draw a stress strain diagram for mild steel and show the important points.
d) Define the term thick cylinder?
e) What are the assumptions made in the theory of torsion?
f) What do you mean by volumetric strain and how it is related to the diametral strain of sphere?
g) Define the terms 'slenderness ratio' and 'buckling load'?
h) What is flitched beam and what are its advantages?
i) What is flexural rigidity and torsional rigidity?
j) What is strain energy and how it is differ from resilience?

Q3 **a)** Establish the relation between Young's modulus (E), modulus of rigidity (G) and bulk modulus (K). **(10)**

b) Derive the expression for volumetric strain of a thin cylindrical vessel subjected to internal pressure **(5)**

Q4 **a)** A 200 mm diameter CI pipe has thickness of 12 mm and is closely wound with a layer of 5 mm diameter steel wire under a tensile stress of 60 N/mm^2. If now water under pressure 4 N/mm^2 is admitted into the pipe, find the stresses developed in pipe and stress wire. **(10)**

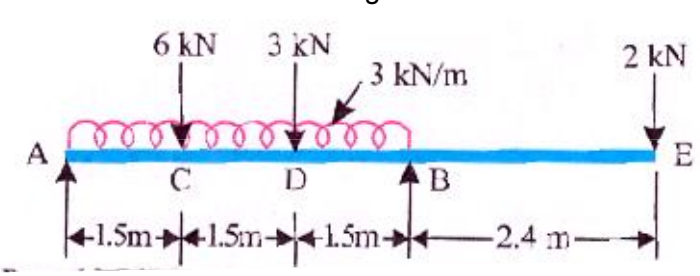
(Take for pipe $E_c = 1x10^5$ N/mm^2, $\gamma=0.3$, for steel $E_s = 2x10^5$ N/mm^2)

b) A cylindrical vessel, whose ends are closed by means of rigid flange plates, is made up of steel plate 3 mm thick. The length and internal diameter of the vessel are 50 cm and 25 cm respectively. Determine the longitudinal and hoop stresses in the cylindrical shell due to an internal fluid pressure of 3 N/mm^2. Also calculate the increase in length, diameter and volume of vessel. Take E = 2×10^5 N/mm^2 and μ =0.3. **(5)**

Q5 **a)** A simply supported beam of span 4m carries a uniformly distributed load of 6kN/m over the entire span. If the maximum allowable stress due to bending is restricted to 150 N/mm^2 , determine the cross sectional dimensions if the section is; **(10)**
(i) Rectangular with depth twice the breadth
(ii) Solid circular section
(iii) Hollow circular section having a diameter ratio of 0.6

b) What you understand by 'beam of uniform strength'? How it can be achieved in case of rectangular cross-section? Explain. **(5)**

Q6 **a)** A beam is loaded as shown in figure. **(10)**



(i) Draw the SF and BM diagram.
(ii) Calculate the maximum BM & point of contraflexure.

b) Explain the Mohr's circle. **(5)**

Q7 **a)** A hollow shaft of diameter ratio 3/8 is required to transmit 600 kW at 110 rpm, the maximum torque being 20 % greater than the mean. The shear stress is not exceed to 63 MN/m^2. And angle of twist in length of 3 meters not to exceed 1.4^0 . Calculate the required external diameter of shaft. **(10)**

b) Explain the equivalent twisting moment, when shaft is subjected to both BM (M) and torsion (T). **(5)**

Q8 **a)** A horizontal cantilever 2.5 m long is of rectangular cross section 50 mm wide throughout its length, and depth varying uniformly from 50 mm at the free end to 150 mm at the fixed end. A load of 3 kN acts at the free end. Find the maximum bending stress induced. **(10)**
(Neglect the weight of the beam)

b) What is 'Wahrl's correction factor'? Explain its importance in spring design. **(5)**

Q9 **a)** Derive an expression for crippling load for the column, when both of the ends are hinged. **(10)**

b) Determine the expression for maximum slope and deflection of a cantilever beam carrying a concentrated load 'W' at its free end. **(5)**