* K C - 6 1 4 7 *

KC-6147

B. E. - II (Sem. III) (Civil) Examination

November / December – 2012

Mechanics of Solids

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 2 (SEM. 3) (CIVIL)

Name of the Subject :

☛ MECHANICS OF SOLIDS

☛ Subject Code No. : 6 1 4 7 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Programmable calculator is not permitted.
(3) Figures to the right indicate full marks.
(4) Assume suitable data iwherever required.
(5) All dimensions are in mm.
(6) If Data is not given assume $E = 2 \times 10^5$ MPa.

1 (a) The overhanging beam ABC is supported at A and B, the span AB being 6 m. The overhang BC is 2m. If carries a uniform distribution load of 30 kN/m over a length of 3m from A and concentrated load of 20 kN at free end. Draw SF and BM diagrams. **10**

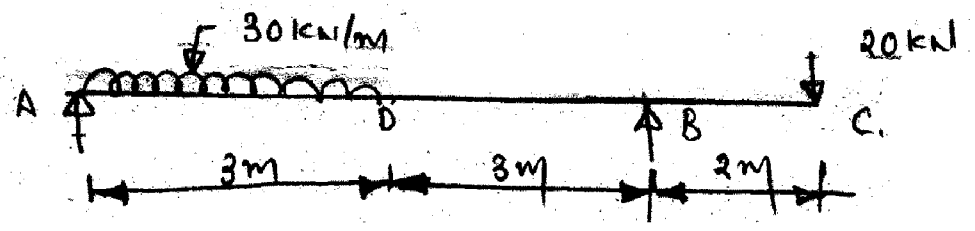

Fig. 1

(b) Explain "Kernal of section". **10**

OR

(b) Explain following terms : **10**

Poisson ratio, modulus of rigidity, bulk modulus, modulus of elasticity, thermal stress, lateral strain, point on inflection, sogging moment, hogging moment, linear strain.

2 Attempt any **three** : **30**

(1) A timber beam is freely supported 6m. apart. It carries a uniformly distributed load of 12 kN/m and a concentrated load 9 kN at 2.5 m from left support. If stress in timber is not exceed 8 N/mm^2. Design a suitable section making the depth twice width.

(2) Explain limits of eccentricity and explain for circular and rectangular section.

(3) A simply supported beam carries a uniform distribution load of intensity 30 N/mm. Over the entire span of 1 m. The cross-section of beam is a T-section as shown in fig. 2 Calculate maximum shear stress for the section of the beam.

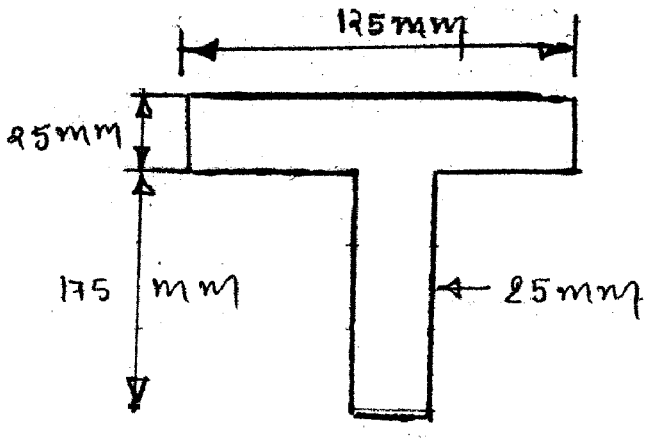

Fig. 2

(4) A rectangular block of material is subjected to a tensile stress of 100 N/mm^2. On one plan and tensile stress of 50 N/mm^2. On a plan at right angles together with shear stress of 60 N/mm^2. On the same plan find

(i) the direction of principal plan

(ii) The magnitude of principal stress

(iii) The magnitude of greatest shear stress.

3 (a) Define Resilience, Proof Resilience and Modulus of Resilience. **3**

(b) Derive the expression for instantaneous stress due to impact load. **7**

4 Attempt any **two** :

(a) A cylindrical vessel closed with plan ends is made of 5 mm thick steel plates. Its diameter is 250 mm and length is 750 mm. it is subjected to an internal fluid pressure of 4 N/mm^2. Calculate the longitudinal and hoop stresses in the shell plate. Also calculate, change in volume. Take E = 210 GN/m^2 and Poisson's ratio = 0.3. **10**

(b) A steel bar 2000 mm in length is subjected to a pull such that the maximum stress is equal to 100 N/mm^2. Its cross section area is 200 mm^2 over a length of 1000 mm and for the middle 1000 mm length the sectional area is 100 mm^2. If E = 2×10^5, calculate strain energy stored in the bar. **10**

(c) A solid circular steel shaft of length 4.5 m transmits 400 kW power at 450 rpm. If the allowable shearing stress is limited to 70 MPa and allowable angle of twist is 0.045 radian determine the diameter required for this shaft. Take G = 80 GPa. **10**

5 Attempt any **two** :

(a) A hollow cast iron column rigidly fixed at one end and pin jointed at the other end has 150 mm outer diameter and 120 mm inner diameter. Its length is 6 m and E = 90 GN/m^2. Calculate the critical load of this column by Euler's Formula. **10**

(b) (i) Differentiate between thick and thin shell. **5**

(ii) State assumptions made in Euler's theory for Long Columns. **5**

(c) Explain the terms and give formulae for Percentage elongation, ultimate stress, Percentage reduction in area, limit of proportionality nominal breaking stress. **10**