Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– 1st / 2nd • EXAMINATION – SUMMER • 2014

Subject Code: 110010 **Date: 26-06-2014**

Subject Name: Mechanics of Solids

Time: 02:30 pm - 05:30 pm **Total Marks: 70**

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Fill in the blanks with the most appropriate answer. Write complete sentence with the answer. **07**

1) Three coplanar non-parallel forces in equilibrium will_____be concurrent. [always, never, sometimes]
2) A M.S. bar under tension test shows the property of_____. [malleability, ductility, tension ability]
3) Which one of the expression is not true_____. [E=2G(1+μ), E=3K(1-2μ),E=9KG/(3G+K),M= I/Y]
4) Point of contraflexture is where _____.[shear force is zero, shear force changes sign, B.M.is zero, B.M. changes sign]
5) The shape of shear force diagram for cantilever beam subjected to couple at free end is _____. [horizontal straight line, zero, parabola, hexagonal]
6) All joints in a truss are _____ joints.[pin, fixed, rigid]
7) On oiling the lifting machine_____is NOT affected. [velocity ratio, mechanical advantage, efficiency, law of machine]

(b) Define Hardness, Toughness, Equilibrant, Poisson's ratio, Perfect truss, Bulk modulus of elasticity and Particle. **07**

Q.2 **(a)** Determine the resultant of the forces acting on the board as shown in figure 1. **06**

(b) The extremities A & D of a light inextensible string ABCD are tied to two points in the same horizontal line. Weight W &3W are tied to the string at the points B &C resp. of AB&CD are inclined to the vertical at angles 60^o & 30^o resp.Show that BC is horizontal & find the tensions in the various parts of the string as shown in figure 2. **08**

Q.3 A beam is loaded as shown in figure 3

1) Determine the reactions at supports **07**

2) Draw S.F diagram for the beam **03**

3) Draw B.M diagram for the beam & determine the magnitude of maximum B.M. **04**

Q.4 A section of beam as shown in figure 4 is subjected to a B.M of 10 KN m about the major axis & A S.F of 20KN.

1) Determine the M.I. of the section about both the centroid axis. **07**

2) Draw bending stress distribution across the section. **03**

3) Draw shear stress distribution across the section **04**

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Q.5 A truss is loaded as shown in figure 5. Determine

1) The support reactions **06**

2) Internal forces in the members. **08**

Q.6 **(a)** A 5m long ladder & 250N weight is placed against a vertical wall in a position where it's inclination to the vertical is 30^{o}. A man weighing 800N climbs the ladder. At what position will he induce slipping? The coefficient of friction between floor & ladder is 0.2 & that between vertical wall & ladder is also 0.2. **07**

(b) For an element as shown in figure 6. Find 1) Principal stresses & location of corresponding principal planes 2) Maximum shear stress & location of planes containing it. **07**

Q.7 **(a)** The V.R of the lifting machine is 50. By this machine to lift a load of 4000N an effort of 100N is required .Find (a) MA, (b)ή of M/C, (c) is the M/C reversible or self locking and (d) if reversible, what maximum effort should be applied to prevent reversal of motion. **07**

(b) A rectangular block of material is 250 mm long, 100mm wide and 80mm thick. If it is subjected to a tensile load of 200kN, compressive load of 300kN and tensile load of 250kN along its length, width and thickness respectively. Find the change in volume of the block. Take E= 210GPa and Poisson's ratio μ=0.25. **07**

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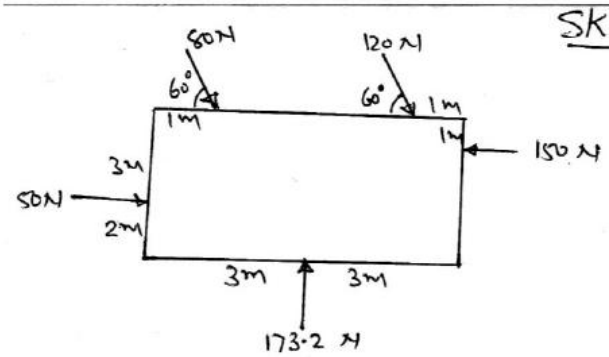
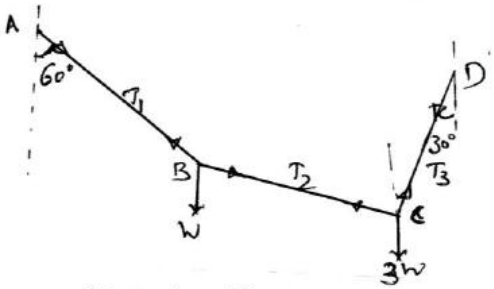
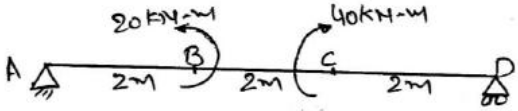
SKETCHES



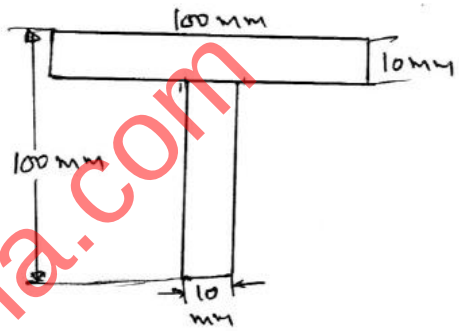
Q. 2 (a) Figure : 1



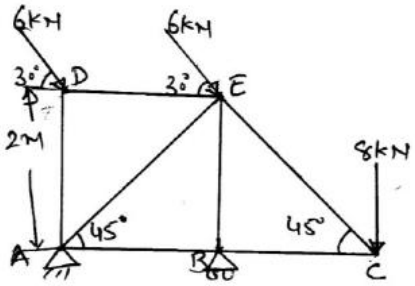
Q. 2(b) Figure : 2



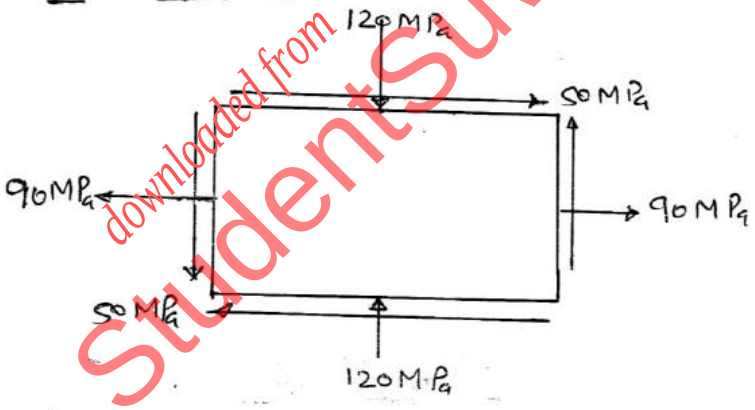
Q.3 Figure : 3



Q. 4 Figure : 4



Q 5 Figure : 5



Q (6) (b) Figure : 6

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