Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III EXAMINATION – SUMMER 2015

Subject Code:2130608 Date:09/06/2015

Subject Name: Strength of materials

Time: 02:30pm to 05:00 pm Total Marks: 70

Instructions:

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

Q 1(a)	State assumptions made in the theory of pure bending. Derive the equation of bending stress distribution across the cross section in a beam subjected to general loading.	07
(b)	Calculate shear force and bending moment at salient points of the beam as shown in figure 1and also draw shear force and bending moment diagram for the beam .	07
Q 2 (a)	A rolled I section has the dimension as shown in Figure 2 .This beam of I section carries a UDL of 40 KN/m run on a span of 10 m,Calculate the maximum stress produced due to bending.	07
(b)	Derive the Torsion Equation.	07
	OR	
(b)	A cantilever of length 2 m carries a UDL of 1.5 KN/m run over the whole length and a point load of 2 KN at a distance of 0.5 m from the free end. Calculate shear force and bending moments and plot the S.F and B.M diagrams.	07
Q 3 (a)	Derive the relation between S.F and B.M in a beam subjected to general loading.	04
(b)	Explain the sign convention taken to compute Shear force and Bending moment.	03
(c)	Obtain an expression for the major and minor principal stresses on a plane, when the body is subjected to direct stresses in two mutually perpendicular directions accompanied by a shear stress.	07
	OR	
Q 3 (a)	A block of 10 N weight rest on a rough inclined plane. The inclination of plane with horizontal is 30°.If coefficient of friction is 0.25. Calculate the force that is to be applied parallel to move the block upwards.	07
(b)	A solid shaft of 120 mm diameter is required to transmit 200 KW at 100 rpm.If the angle of twist not to exceed 2°.Find the length of the shaft .Take modulus of rigidity for the shaft material as 90 GPa.	07
Q 4 (a)	A simply supported wooden beam of span 1.3 m having a cross section 150 mm wide by 250 mm deep carries a point load of W at the centre. The permissible stress are 7 N/ mm^2 in bending and 1 N/ mm^2 in shearing. Calculate the safe load W.	07
(b)	Explain the law of static friction and law of dynamic friction. Also define (1) angle of friction (2) angle of repose (3) coefficient of friction.	07
	OR	
Q 4 (a)	Determine the diameter of shaft which will transmit 100 KW at 150 rpm.If	07

maximum shearing stress is limited to 50 N/ mm^2.

(b) Draw shear stress distribution diagram for the following section 04
(1)Rectangular section (2)Circular section (3) I section (4)T section

(c) Explain the principal planes principal stresses and natural axis. 03

Q 5 (a) A simply supported beam of 4 m span carries a point load of W at 1 m from one support. Find the value of this load so that maximum bending stress in tension and compression are limited to 100 MPa and 80 MPa respectively. The cross section of the beam is a Tee section as shown in figure 3 with top flange in compression. 07

(b) Define (1)Hardness (2)Toughness (3) Ductility (4) Brittleness (5)Factor of safety (6)Ultimate strength (7)working stress 07

OR

Q 5 (a) Draw the shear force and bending moment diagrams for the beam as shown in figure 4. 07

(b) The stresses at a point in a bar are 200 MPa (tensile) and 100 MPa (compressive).Determine the resultant stress in magnitude and Direction on a plane inclined at 60°. to the axis of the major stress. 07

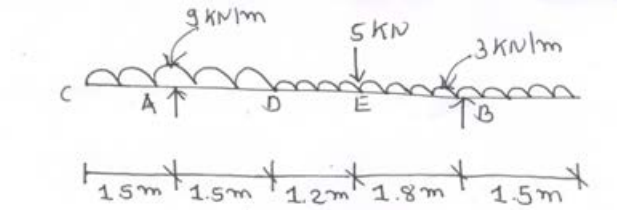

Figure 1 Oue 1 (a)

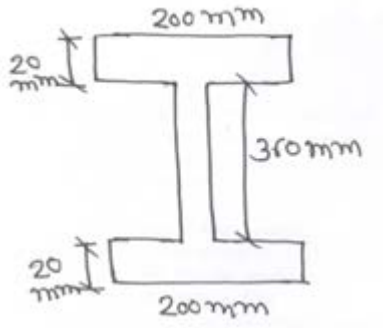

Figure 2 Que 2 (a) (web thickness is 10 mm)

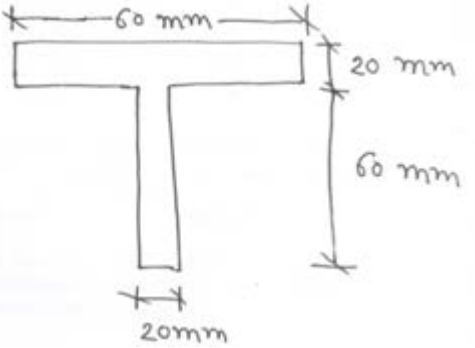

Figure 3 Que 5 (a)

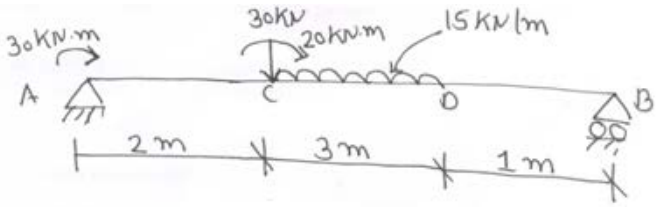

Figure 4 Que 5 (a)or

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