Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(New) • EXAMINATION – WINTER 2016

Subject Code:2130608 **Date:04/01/2017**

Subject Name:Strength of Materials

Time:10:30 AM to 01:00 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) Short Questions **07**

1 Shear stress in surface fiber of a circular shaft in torsion is:
(a) Minimum (b) Zero (c) Maximum (d) none of these.

2 Maximum stress on a principle plane is :
(a) Tangential stress (b) shear stress (c) normal stress (d) none of these.

3 A beam/cantilever is simple (pure) bending has:
(a) No bending moment (b) No shear force (c) Varying bending moment
(d) Varying shear force.

4 The number of principal planes in any combination of applied stress always is:
(a) 1 (b) 2 (c) 3 (d) 4.

5 Strength of beam is more if its section modulus is:
(a) Decreased (b) Zero (c) Increased (d) None of these.

6 At the point of inflexion (contra flexure) we have:
(a) Zero shear force (b) zero bending moment (c) Maximum bending moment
(d) Maximum shear moment.

7 A material having identical properties in all directions, is called,
(a) Elastic (b) homogeneous (c) isotropic (d) all the above.

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

Q.2 (a) Explain the sign convention taken to compute Shear force and Bending moment **03**

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

(b) What power can be transmitted by a hollow circular shaft of 10cm outer diameter and 8cm inside diameter while rotating at 150 rpm if the maximum permissible shear stress is 60MN/m^2 and the maximum torque is 1.3 times the mean torque? **07**

OR

(b) A circular log of timber has diameter D. find the dimensions of the strongest rectangular section to resist moment, one can cut from this log. **07**

Q.3 (a) Explain the principal planes, principal stresses and natural axis. **03**

(b) A simply supported beam is shown in fig Q-3(b) of span 5m has a cross-section 150mm ×250mm .if the permissible stress is10N/mm^2,find(a) Maximum intensity of u.d.l it can carry. **04**

(c) Derive the Torsion equation with usual notations. **07**

OR

Q.3 (a) Explain in simple theory of bending. **03**

(b) Write short note on (i) working stress (ii) load factor (iii) strain hardening. **04**

(c) At a point in a strained material there is tensile stress of 80N/mm2 upon a horizontal plane and a compressive stress of 40N/mm2 upon a vertical plane There is also a shear stress of 48N/mm2 upon each of these planes in fig Q-3 ©Determine the **07**

planes of maximum shear stress at the point. Determine also the resultant stress on the planes of maximum shear stress.

Q.4	**(a)**	Write short note on Torsion rigidity.	**03**
	(b)	Explain MOHR'S circle of stress?	**04**
	(c)	Draw the bending moment and shear force diagrams for the cantilever beam shown in fig.Q-4©.	**07**

OR

Q.4	**(a)**	Define: Friction and also explain ladder& wedge friction.	**03**
	(b)	Explain static and kinetic friction.	**04**
	(c)	A hollow propeller shaft of a steam ship is to transmit 3750kW at 240rpm.if thee internal diameter is 0.8times the external diameter and if the maximum shear stress developed is to be limited to 160 N/mm2,determine the size of the shaft.	**07**
Q.5	**(a)**	Explain : (i) cone of friction (ii) coefficient of friction (iii) Laws of friction	**03**
	(b)	Prove with usual notations $T1/T2=e\mu^{\theta}$ for belt friction.	**04**
	(c)	The cross-section of a beam is shown in fig **Q-5©** if permissible stress is 150 N/mm^2, find its moment of resistance. Compare it with equivalent section of same but (a) square section (b) rectangular section with depth twice the width and (c) a circular section.	**07**

OR

Q.5	**(a)**	Explain element subjected to general two dimensional stress system.	**03**
	(b)	Prove with usual notation the maximum shear stress for a rectangular section is 1.5 times the average shear stress.	**04**
	(c)	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**

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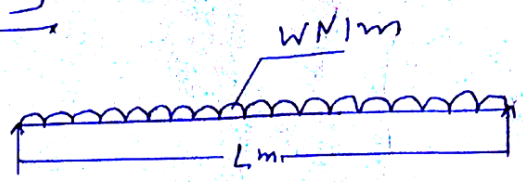
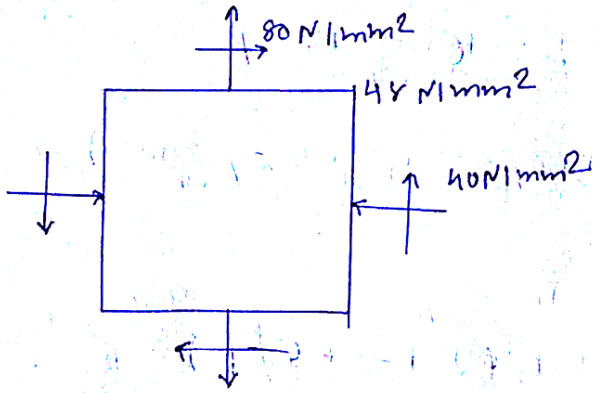
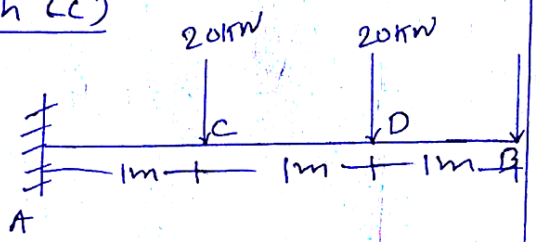
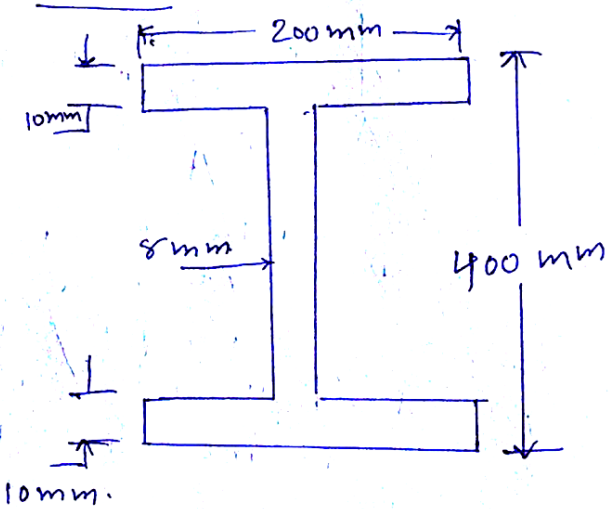
Q. 3[b]



Q. 3 [c]



Q.4 (c)



Q.5 (c)