

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III (New) EXAMINATION – WINTER 2015

Subject Code:2130608

Date:02/01/2016

Subject Name: STRENGTH OF MATERIAL

Time: 2:30pm to 5:00pm

Total Marks: 70

Instructions:

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

		MARKS
Q.1	Short Questions	14
1	The friction always acts in the direction. (a) Of the force (b) Opposite to the force (c) Opposite to that in which the body tends to move (d) Perpendicular to the force	
2	The magnitude of the force of friction between two bodies, one laying above the other depends upon the roughness of the magnitude of the force of friction between two bodies, one laying above the bodies, one laying above the (a) Upper body (b) Lower body (c) Both the bodies (d) The body having more roughness	
3	A circular section shaft of dia. $D(m)$ is used to transmit H (kw) of power at N r.p.m. The maximum tensile stress(Mpa) induced on the surface of the shaft is $K.H/d^3$ $N.K$ is for circular shaft following (a) 0.48 (b) $0.48\pi^2$ (c) 0.48π (d) $0.48/\pi^2$	
4	Two shafts of 20 mm dia. Each are connected by flange coupling bolted by four bolts of 10 mm dia. Each and subjected to shearing stress of 15 N/mm ² . The maximum shearing stress induced in shaft is (a) 15 N/mm ² (b) 45 N/mm ² (c) 60 N/mm ² (d) 75 N/mm ²	
5	On a principal plane the magnitude of shear stress will be equal to (a) Maximum (b) Minimum (c) Zero (d) Infinity	

- 6 When a body is subjected to two tensile stresses of equal magnitude on two mutually perpendicular planes, the radius of Mohr circle will be
- (a) Maximum
 - (b) minimum
 - (c) zero
 - (d) infinity
- 7 If a body does not regain its original size and shape on removal of an externally applied load and gets permanently deformed, it is called a
- (a) Elastic body
 - (b) Plastic body
 - (c) Rigid body
 - (d) None of above
- 8 A material can not undergo any deformation under the action of external loads and it fails by rupture , it is called
- (a) Elastic material
 - (b) Plastic material
 - (c) Ductile material
 - (d) Brittle material
- 9 As the elastic limit reaches, tensile strain
- (a) Increases more rapidly
 - (b) Decreases more rapidly
 - (c) Increases in proportion to the stress
 - (d) Decreases in proportion to the stress
- 10 The materials which have the same elastic properties in all directions, are called
- (a) Isotropic
 - (b) Brittle
 - (c) Homogeneous
 - (d) Hard
- 11 When equal and opposite forces applied to a body, tend to elongate , the stress so produced, is called
- (a) shear stress
 - (b) compressive stress
 - (c) tensile stress
 - (d) transverse stress
- 12 A simply supported beam of span L carries a uniformly distributed load W. The maximum bending moment M is
- (a) $WL/2$
 - (b) $WL/4$
 - (c) $WL/8$
 - (d) $WL/12$
- 13 For a simply supported beam with a central load, the bending moment is
- (a) least at the centre
 - (b) least at the support
 - (c) maximum at the support
 - (d) maximum at the support
- 14 Simple bending equation is
- (a) $M/I = R/E = F/Y$
 - (b) $I/M = E/R = Y/F$
 - (c) $M/I = E/R = F/Y$
 - (d) $M/I = R/E = Y/F$

Q.2	(a)	Explain the sign convention taken to compute shear force and bending moment.	03
	(b)	Derive relation between S.F. and B.M. in a beam subjected to general loading	04
	(c)	A cantilever of length 2m carries a UDL of 1.5KN/m run over the whole length and a point load of 2 KN at a distance of 0.5m from the free end. Calculate shear force and bending moments and plot the S.F. and B.M. diagrams.	07
OR			
	(c)	Draw shear force and bending moment diagram for the beam as shown in figure 1.	07
Q.3	(a)	Explain neutral axis and pure bending moment of resistance.	03
	(b)	Explain assumptions made in theory of pure bending.	04
	(c)	A simply supported beam of 4m span has a cross section 200mmX300mm. if the permissible stress in the material of the beam is 20 N/mm ² . determine maximum udl it can carry.	07
OR			
Q.3	(a)	Explain maximum bending moment.	03
	(b)	Explain theory of pure bending	04
	(c)	A beam having an I section with top flange 80mmX40mm, web 120mmX20mm and bottom flange 160mmX40mm, simply supported over a span of 6m, is subjected to uniformly distributed load over entire span. If bending stress is limited to 40 N/mm ² tensile and 120 N/mm ² compressive, find max. value of U.D.L. the beam can carry if the larger flange is in tension.	07
Q.4	(a)	Explain angle of friction.	03
	(b)	Define(i) elastic body(ii) plastic body(iii)rigid body (iv) deformation	04
	(c)	A ladder 6m long rests on horizontal ground and leans Against a smooth vertical wall at an angle of 20° with the vertical. Its weight is 100N acting at its middle. It is on the point of sliding when a man weighing 500N stands on it at a distance 2.2m along the ladder from foot of ladder. Calculate coefficient of friction.	07
OR			
Q.4	(a)	Explain classification of materials.	03
	(b)	Explain behavior of brittle materials under tension(stress strain curve for brittle materials)	04
	(c)	A 4m long ladder has to carry a person of 75kg weight at 3.5 m distance from floor, along the length of ladder. The self weight of ladder is of 150N. find the maximum distance of lower end of ladder from vertical wall so that it does not slide. The coefficient of friction between floor and ladder is 0.3 and that between vertical wall and ladder is 0.2.	07
Q.5	(a)	Explain principal plane and principal stress and neutral axis.	03
	(b)	Explain assumptions in theory of pure torsion.	04
	(c)	A hollow circular shaft of 150mm external diameter and 100mm internal diameter is subjected to a torque of 5 kN.m. find maximum shear stress and shear stress at the internal surface of the shaft.	07

Also, calculate the angle of twist for 2.0 m long shaft, if modulus of rigidity is 100GPa.

OR

- Q.5 (a) Explain torsional stiffness and power transmitted. 03
(b) Explain polar modulus. 04
(c) The shear and normal stresses on a cross section of a beam as shown in figure 2. Find the principal stresses and direction of principal planes. 07

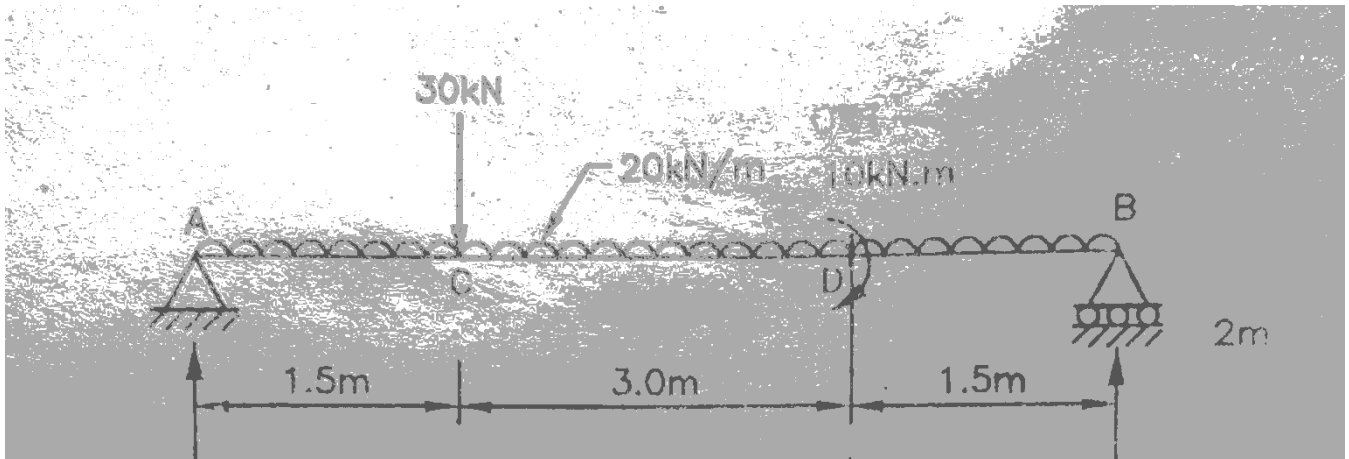


Figure 1

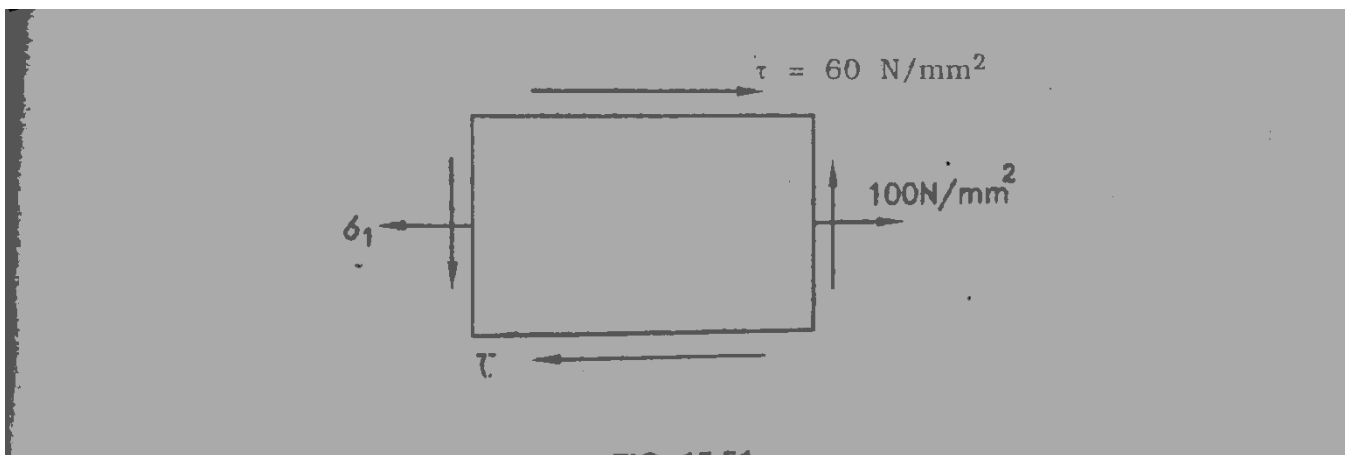


Figure 2