Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2017

Subject Code: 2130608 Date:17/11/2017

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.**

			MARKS
Q.1	**(a)**	Define : (1)Hardness (2)co-efficient of friction (3)Shear Modulus	**03**
	(b)	Enlist various type of loads and type of supports.	**04**
	(c)	Find support reactions for the beam shown in Fig.1	**07**
Q.2	**(a)**	State assumptions made in the theory of pure bending.	**03**
	(b)	Derive the equation of bending stress distribution across the cross section in a beam subjected to general loading.	**04**
	(c)	A ladder AB is 4.5m long and 450N weight rests on a rough horizontal floor at end B and vertical wall at A making 60° with horizontal. The co-efficient of static friction is 0.4 for all contact surfaces. A man of 800N weight climbs on the ladder. Determine the minimum distance travelled on the ladder, when it is on the verge of slipping.	**07**
		OR	
	(c)	A ladder 7 m long rests against a vertical wall with which it makes an angle of 450 and resting on a floor. If a man whose weight is one half of that the ladder, climbs it. At what distance along the ladder will he be when ladder is about to slip?μs = 1/3 at wall and 1/2 at floor.	**07**
Q.3	**(a)**	Explain the principal planes, principal stresses and natural axis.	**03**
	(b)	Derive the Torsion equation with usual notations.	**04**
	(c)	Draw Shear Force and Bending Moment diagram for the beam shown in figure. 2	**07**
		OR	
Q.3	**(a)**	Write short note on Torsion rigidity.	**03**
	(b)	Explain MOHR'S circle of stress?	**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.4	**(a)**	Explain static and kinetic friction.	**03**
	(b)	Prove with usual notation the maximum shear stress for a rectangular section is 1.5 times the average shear stress.	**04**
	(c)	The Rectangular block of size 300mm (b) x 450mm (d) is subjected to a uniform bending moment 120 kNm. Calculate the bending stresses at extreme fiber of the blocks. Also, find out total tensile and compressive forces due to bending stresses. Draw bending stress distribution diagram also.	**07**
		OR	
Q.4	**(a)**	Explain element subjected to general two dimensional stress system.	**03**
	(b)	Draw representative shear stress distribution diagrams for Hollow rectangle, b) I section, c) Hollow circle	**04**

	(c)	At a point in a strained material the normal tensile stress are 60 N/mm2 and 30 N/mm2. Determine by Mohr's circle, the resultant intensity of stress on a plane inclined at 400 to the axis of the minor stress.	**07**
Q.5	**(a)**	Enumerate various types of supports with neat symbolic sketches, showing possible reactions.	**03**
	(b)	The Rectangular block of size 300mm (b) x 450mm (d) is subjected to a shear force 80 kN. Calculate the Shear stresses at neutral axis and Junction of the blocks. Draw Shear stress distribution diagram also.	**04**
	(c)	A solid steel circular shaft is required to transmit a torque of 6.5 kNm. Determine minimum diameter of the shaft, if shear stress is limited to 40 N/mm2 and angle of twist should not exceed 0.5º per meter. Take Modulus of rigidity C = 85 GPa.	**07**

OR

Q.5	**(a)**	A solid steel shaft is to transmit a torque of 1 kN.m. If the shearing stress is not to exceed 45 N/mm2. Find the minimum diameter of the shaft.	**03**
	(b)	A solid steel shaft has to transmit 350 kW at 900 r.p.m. Find the diameter of the shaft if the shear stress is to be limited to 125 N/mm2. Calculate the diameter of the shaft if hollow shaft is provided of internal diameter equals 0.75 times external diameter	**04**
	(c)	A weight 750 N just starts moving down a rough inclined plane supported by a force of 250 N acting parallel to the plane and it is at the point of moving up the plane when pulled by a force of 350N parallel to the plane. Find the inclination of the plane and the co-efficient of friction between the inclined plane and the weight	**07**

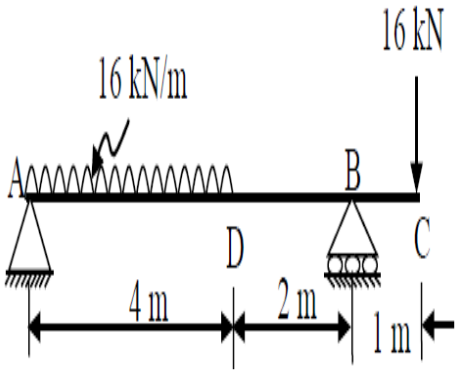

Fig.1

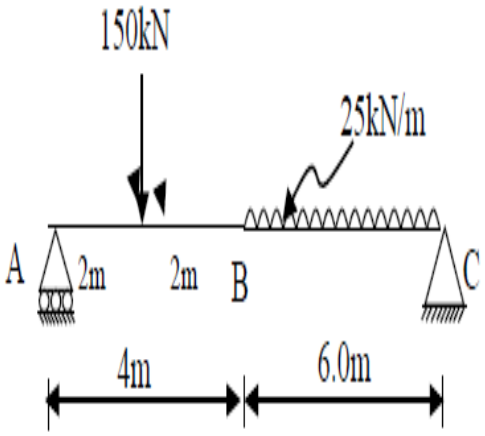

Fig. 2