

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-1<sup>st</sup> / 2<sup>nd</sup> (SPFU) EXAMINATION- SUMMER 2018**

**Subject Code: ENG004**

**Date: 24/05/2018**

**Subject Name: Mechanics of Solids**

**Time: 2:30 PM to 5:00 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) Define: (i) Modulus of Elasticity (ii) Lateral strain (iii) Poisson's ratio **07**  
(B) Draw bending moment diagram and shear force diagram for a simply supported beam of length 'L', subjected to udl of 'w' kN/m throughout the length and 'W' at the center of a beam. **07**
- Q.2** (A) (a) Define : Angle of Repose **07**  
(b) State and explain the Laws of Static friction.  
(B) In a machine it was found that an effort had to be moved through a distance of 350 mm to move the load by 7mm. Using this machine a load of 48,000 N was raised by an effort of 1200 N. Determine (i) velocity ratio of the machine (ii) Mechanical advantage (iii) efficiency (iv) Load can be lifted with 1200 N effort under ideal condition. **07**
- Q.3** (A) Derive the relation between shear force and bending moment. **07**  
(B) State and prove parallel axes theorem. Find moment of inertia of rectangular section using first principle. **07**
- Q.4** (A) Explain the law of static friction. Also explain the terms: Angle of repose and angle of friction. **07**  
(B) Define: (i) Vector quantities (ii) Resolution of force (iii) Couple **07**
- Q.5** (A) A rod of length 1m and diameter 20mm is subjected to tensile load of 20kN. The increase in length of rod is 0.3mm and decrease in diameter is 0.0018mm. Calculate the Poisson's ratio and Modulus of Elasticity. **07**  
(B) Determine the support reactions of a cantilever beam having length 'L' subjected to point load 'W' at tip and 'W/2' at the center of a beam. **07**
- Q.6** (A) Determine the horizontal force required to cause the motion of the block weighing 550N as shown in fig.1. Take  $\mu = 0.55$ . **07**  
a. To impend the motion downward  
b. To impend up the plane  
(B) A uniform wheel of 80 cm diameter and 1500 N weight rests against a rigid rectangular block of thickness 30 cm as shown in fig. 2. Considering all **07**

surfaces smooth, determine

- a) Least pull to be applied through the center of wheel to just turn it over the corner of the block,
- b) Reaction of the block.

- Q.7** (A) State the condition of equilibrium for Co-planer force system. **07**  
 (B) Determine the centroid of the lamina shown in Fig. 3. **07**

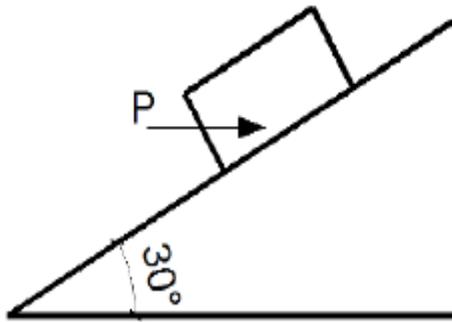


Fig. 1

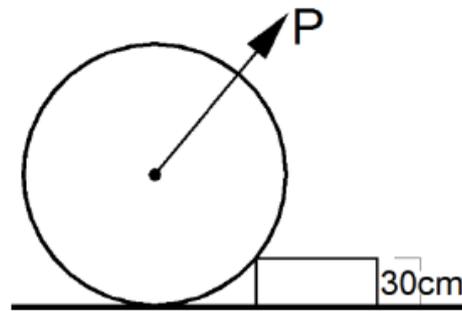


Fig. 2

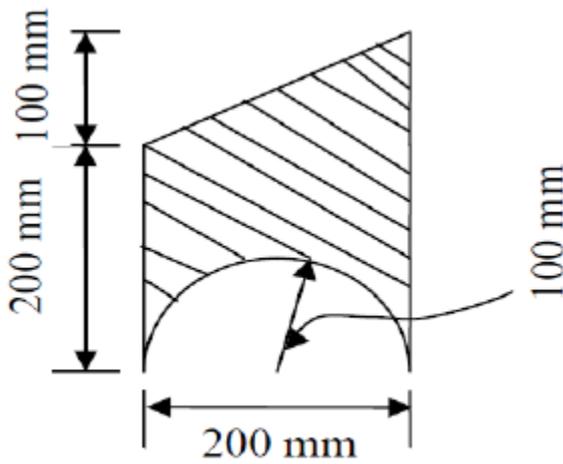


Fig. 3