

Total number of printed pages-4

43 (ARC-1) 1.5

2018

**STRUCTURE-I**

Paper : ENG 1.5

Full Marks : 100

Time : Three hours

**The figures in the margin indicate full marks for the questions.**

Answer **any five** questions.

- (a) What are the different types of supports? Explain with neat sketches and force-displacement criteria. 10
- (b) Find the reactions and tension in the string when loads are applied as shown in fig. 1. 10

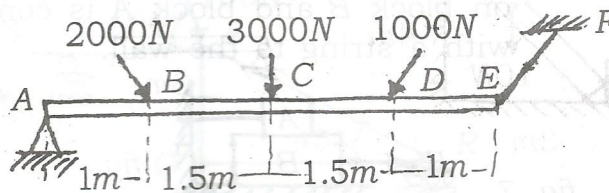
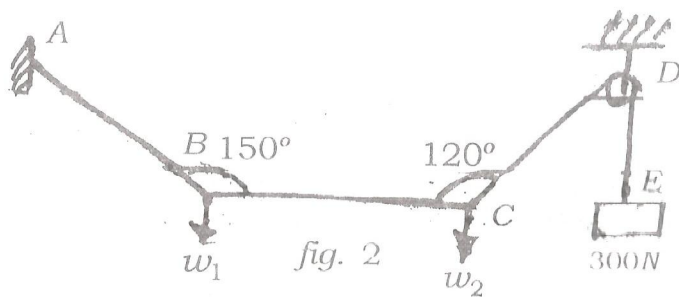


fig. 1

Contd.

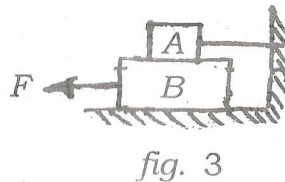
2. (a) Explain the different types of equilibrium with neat sketches. 5

(b) Determine the loads  $w_1$  and  $w_2$  along with tension in the strings  $AB$ ,  $BC$ ,  $CD$  if the system as shown in *fig. 2* is in equilibrium. Weight of box  $E$  is  $300N$ . 15



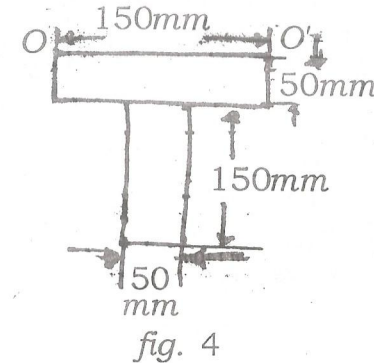
3. (a) Define coefficient of friction. What are the differences between coefficient of dynamic friction and static friction? 5

(b) Find the maximum force  $F$  if the weight of block  $A$  is  $4N$ , weight of block  $B$  is  $8N$  and coefficient of static friction is  $0.25$ . As shown in *fig. 3*, block  $A$  rests on block  $B$  and block  $A$  is connected with a string to the wall. 15



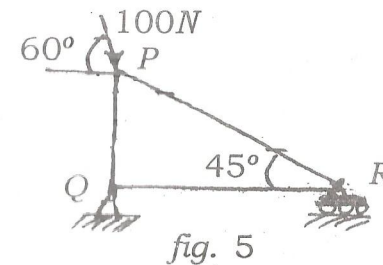
4. (a) Derive the Moment of Inertia about the centroidal axis of rectangular lamina of width ' $b$ ' and depth ' $d$ '. 10

(b) Find the Moment of Inertia of the section shown in *fig. 4*. All dimensions are in *mm*. Find about  $O-O'$ . 10

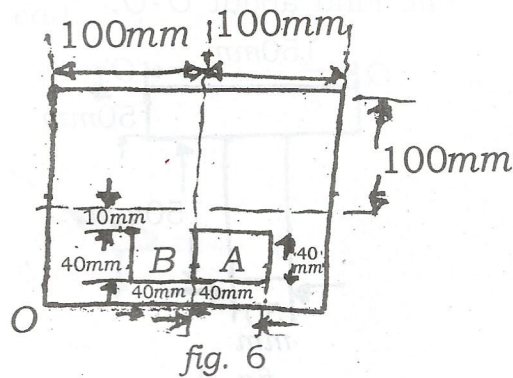


5. (a) Define Lami's theorem with neat sketches. 5

(b) For the truss shown in *fig. 5*, find the magnitude of the forces in members  $PR$ ,  $QR$ ,  $PQ$  and the support reactions. 15



6. (a) What is Parallel Axis theorem? 5
- (b) Find the centroid of the lamina about the point  $O$  if  $A$  area is removed. What will be the centroid if both the  $A$  area and  $B$  area are removed? Check *fig. 6*. 15



7. (a) What is a Free-Body Diagram? 5
- (b) Draw the Free-Body Diagrams of the following Massless beams as shown in *fig. 7* and *fig. 8*. 15

