

Printed Pages: 7

ME-201

(Following Paper ID and Roll No. to be filled in your  
Answer Books)

**Paper ID : 199218**Roll No. 

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**B.TECH.****Theory Examination (Semester-II) 2015-16****ENGINEERING MECHANICS****Time : 3 Hours****Max. Marks : 100**

**Note:** This paper having three sections. Attempt question  
from each section as per instruction.

**Section-A**

**Q1. Attempt all questions. Each question carries equal marks.**  
**(2×10=20)**

- a) Write the equations of equilibrium for concurrent and non concurrent force system.
- b) Explain the principle of transmissibility.
- c) Explain Lamis' theorem, also write down the limitations of Lamis' theorem.
- d) Explain the terms: (i) Angle of friction (ii) Angle of repose (iii) Cone of friction.

(1)

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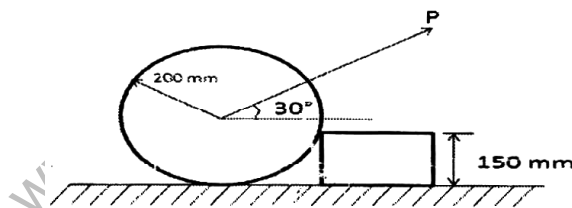
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- e) Write down the statements of (i) Parallel axis theorem (ii) Perpendicular axis theorem.
- f) Write down the work energy principle.
- g) Differentiate between centroid and centre of gravity.
- h) Define radius of gyration of a rigid body.
- i) Explain the principle of virtual work.
- j) Write down the principle of conservation of Linear momentum.

**Section-B**

**Q2. Attempt any five question this section (5×10=50)**

- (a) Find the force to pull the roller over the hurdle as shown in the figure. Radius of roller is 200 mm.



**Fig. 1**

- (b) Find the support reactions at B and E for the beam system as shown in figure.

(2)

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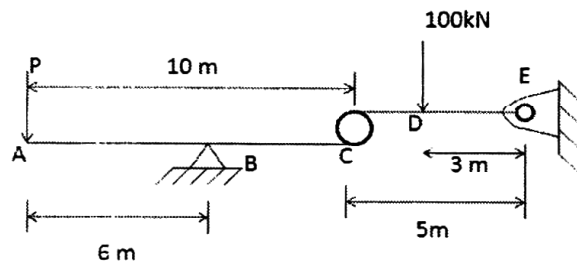


Fig. 2

- (c) A ladder of length  $L$  rests against a wall, the angle of inclination being  $45^\circ$ . If the coefficient of friction between the ladder and the ground and that between ground and the wall is  $0.5$  each, what will be the maximum distance on ladder to which a man whose weight is  $1.5$  times the weight of ladder may ascend before the ladder begins to slip?
- (d) Find the moment of inertia about centroidal axis  $X-X$  and  $Y-Y$  of the section shown in fig. 3.

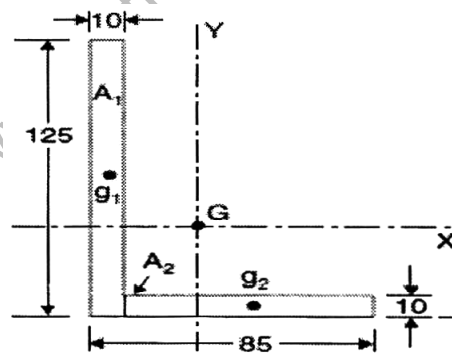


Fig. 3

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- (e) A stone is dropped from the top of a tower 40 m height. At the same instant, another stone is thrown upward from the foot of tower with an initial velocity of 20 m/s. At what distance from the top and after how much time the two stones cross each other? Further proceed to calculate the relative velocity with which the stones cross.
- (f) A disc of radius  $R$  roll without slipping between two plates A and B. If plates are having velocities  $v$  and  $2v$  as shown in fig. 4. Determine the angular velocity of disc and velocity of centre of disc.

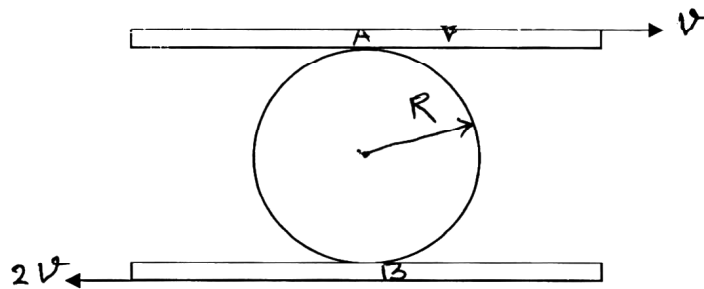


Fig. 4

- (g) A string is wound several time around a solid cylinder of 2Kg mass the free end of the string is fixed to ceiling and the cylinder is released from rest. Determine the velocity after it has fallen through a height of 2m. In addition, determine tension in the string.

(4)

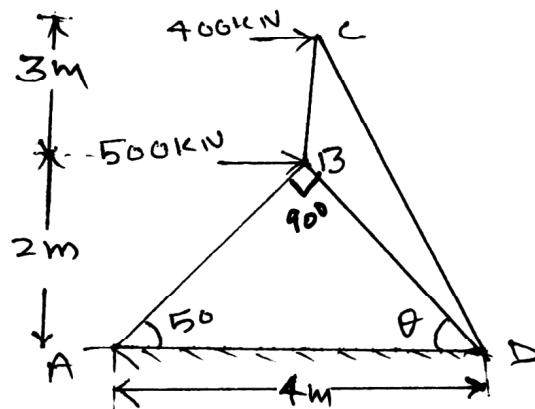
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- (h) A uniform ladder of 300 N weight rests against a smooth vertical wall and a rough horizontal floor making an angle of  $60^\circ$  with the horizontal. Use the method of virtual work to find the frictional force between the foot of ladder and the rough horizontal floor.

**Section-C**

**Attempt Any two question from this section (2×15=30)**

- Q3. Find the forces in all members of truss as shown in below fig. 5 using Method of Joints.



**Fig. 5**

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- Q4. Rod AB weighing 200N is supported by cable wrapped around a semi cylinder having coeff. of friction 0.2. A weight C having mass of 10Kg can slide on rod AB. What is the max range  $x$  from the centre line that centre of C can be replaced with slippage as Shown in fig. 6.

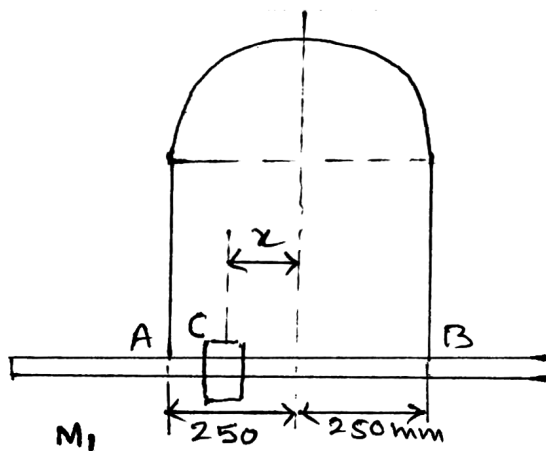


Fig. 6

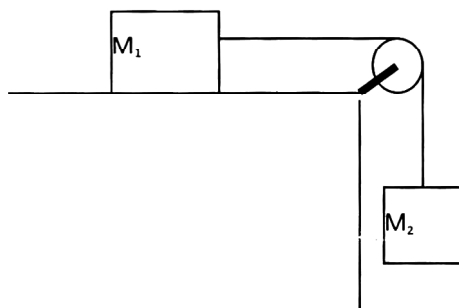
- Q5. A block mass  $M_1$  resting on a rough horizontal plane is pulled by an inextensible string, whose other end is attached to a block of mass  $M_2$  and passing over a pulley as shown in fig. 7. Assume the pulley to be frictionless and mass less. If the coefficient of kinetic friction between the plane and the block is  $\mu$ , derive the expression for the acceleration of the system and tension in the string. If  $m_1 =$

(6)

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$3\text{kg}$ ,  $m_2 = 2\text{kg}$  and  $\mu = 0.2$  them determine the acceleration of the system and tension in the string.



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