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

Paper ID : 199218 Roll No. | | | | | | | | | | |

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.

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 momenturm.

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.

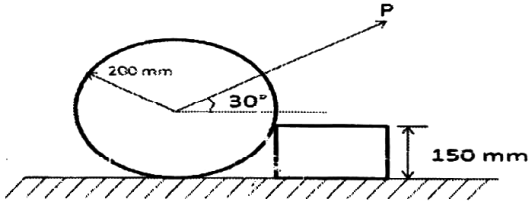

Fig. 1

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

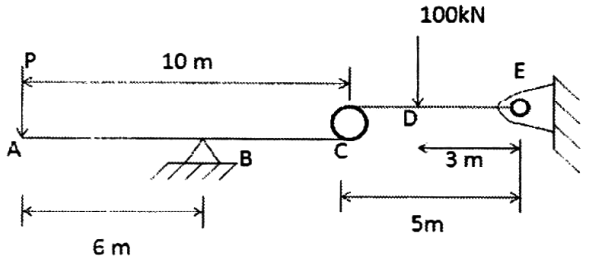

Fig. 2

(c) A ladder of length L rests against a wall, the angle of inclination being 45 degree. 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 beings to slip?

(d) Find the moment of inertia about centroidal axis X-X and Y-Y of the section shown in fig. 3.

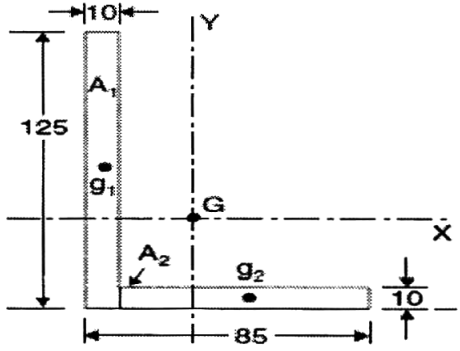

Fig. 3

(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.

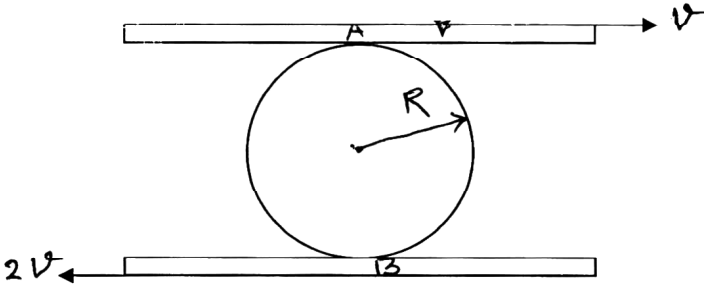

Fig. 4

(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.

(h) A uniform ladder of 300 N weight rests against a smooth vertical wall and a rough horizontal floor making an angle of 60° 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.

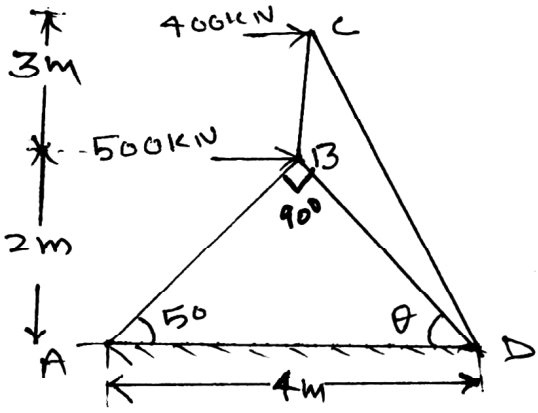

Fig. 5

Q4. Rod AB weighing 200N is supported by cable wrapped around a semi cylinder having coff. 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.

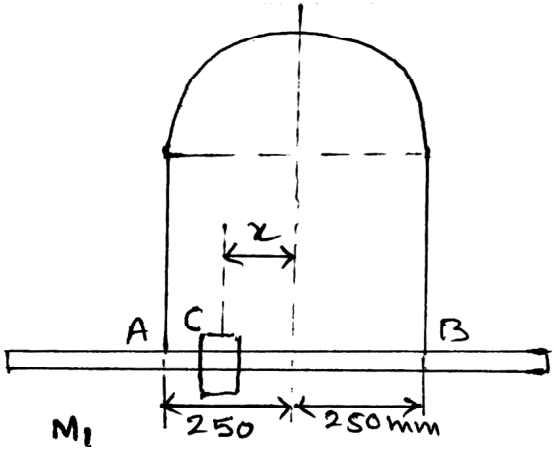

Fig. 6

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 shoown 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 μ, derive the expression for the acceleration of the system and tension in the string. If m_1=

3kg, m_2 = 2kg and μ = 0.2 them determine the acceleration of the system and tension in the string.