B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of First Year)

Paper - VII : ENGINEERING MECHANICS

Time : 3 Hours   **Maximum Marks : 75**

Answer question No. 1 compulsory   *(15)*

Answer ONE question from each unit   *(4 x 15 = 60)*

All questions carry equal marks

1) a) Draw a sketch to show the characteristics of forces.

b) State different laws of mechanics.

c) State the assumptions necessary for the analysis of a plane projectile motion.

d) State D' Alembert's principle for a particle. How is it similar with the equilibrium equation as obtained from Newton's second law, if at all so?

e) Explain the mechanism of impact with reference to the direct central impact.

Unit - I

2) Two metallic rods PQ and QR are fased with in internal angle 55°, and hung as shown in fig. (1), such that QR makes an angle 'θ' in equilibrium condition. Determine the angle θ.
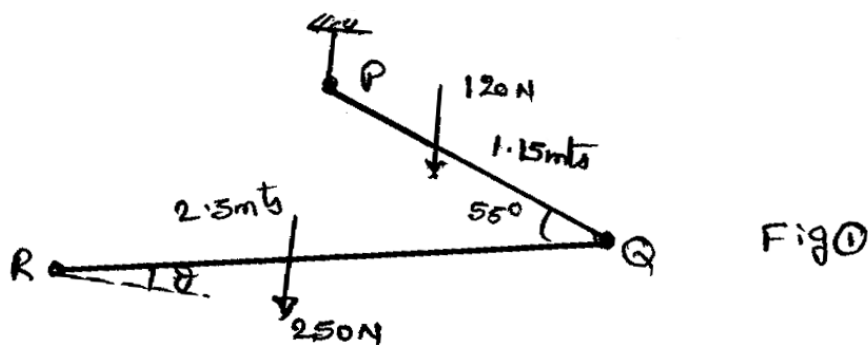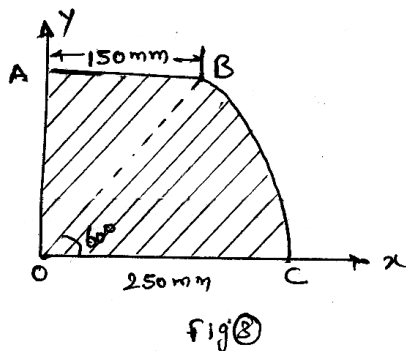

OR

3) Two blocks of weights W_1 and W_2 Connected with a string are at rest as shown in fig. (2) If the angle of friction of each block be ϕ, find the magnitude and the direction of least force 'P' necessary for upper block that will induce sliding.
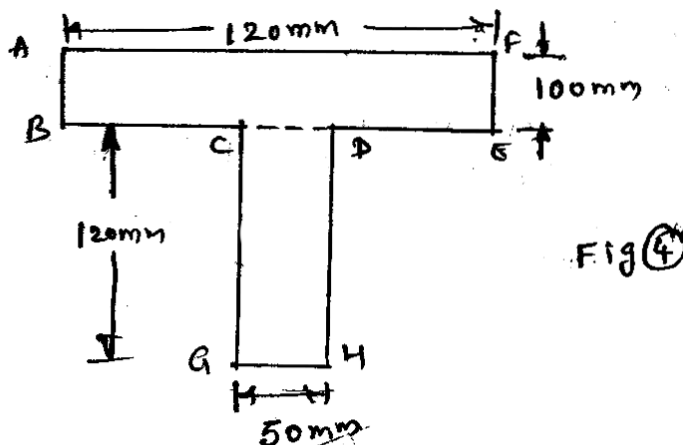

Fig ②
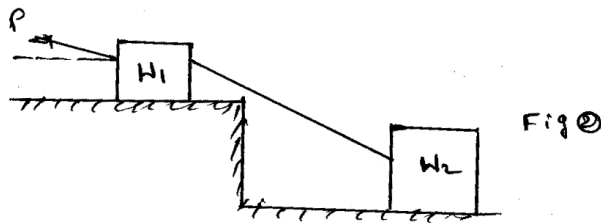
Unit - II

**4)** Locate the centroid of the composite figure OABC shown in fig (3)

fig ③

OR

5) A 'T' section is shown in fig(4). Find the moment of inertia of this section about X-X axis passing through the CG of the section.

Fig ④

Unit - III

6) A ladder of weight 650 N and length 'a' rests against a smooth vertical wall and a rough horizontal floor making an angle of 45° with the Horizontal shown in fig(5). Using the method of virtual wall, find the force of friction of the floor.


Fig (5)
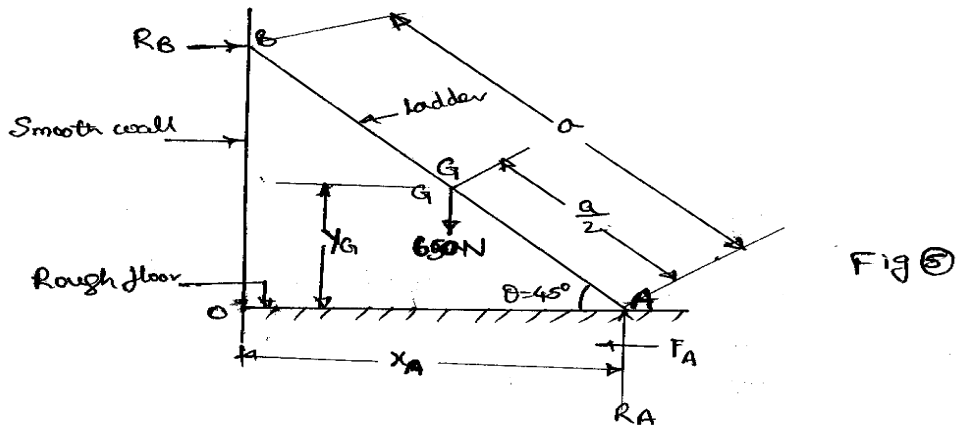
OR

7) a) Explain the term inertia of a body. What do you mean by Inertial force and inertial tonque?

b) Derive the expressions for velocity and acceleration of a particle subjected to a force as a function of velocity.

Unit - IV

8) A train of weight 25000kg is pulled by an engine on a level trace at a constant speed of 58 kmph (as shown is fig(6)). The frictional resistance is 1kg per 100kg of the weight of the train. Determine the power of the engine. If the train is to move with uniform acceleration of $1.2 m/s^2$ on the track after attaining the speed of 58kmph, determine the power of the engine.

Fig (6)
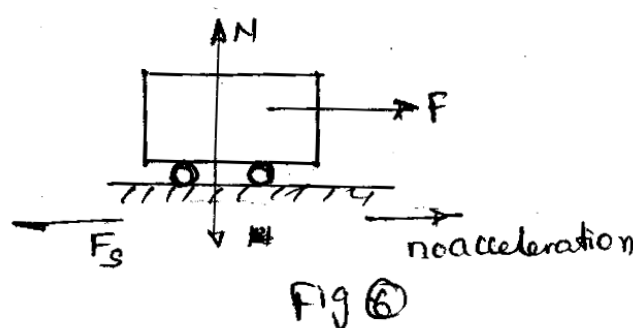
OR

9) The speed of a fly wheel rotating at 250rpm is uniformly increased to 300rpm in 5 seconds. Determine the wall done by the driving torque and the increase in kinetic energy during this time. What do you inter from the result? Take mass of the fly wheel as 25kg and its radius of gyration as 20cm

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