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

Paper ID : 199229 Roll No. | | | | | | | | | | |

B.TECH.

Theory Examination (Semester-II) 2015-16

ENGINEERING MECHANICS

Time : 3 Hours *Max. Marks : 100*

Note: This paper having three section attempt question from each section as per instruction.

Section-A

Ql. ATTEPMT ALL PARTS (2×10=20)

a) State the Varignon's theorem. In what conditions it is used?

b) A body P is about to slip over body Q. Normal reaction at the contact surface is 120 N and the angle of friction is 14°. Determine the friction force.

c) Explain law of transmissibility of forces

d) Define the relationship between load, shear force and bending moment.

e) Write down the assumptions taken during analysis of truss.

f) Determine the maximum bending moment in a simply supported beam having span of 7m and carrying a point load of 50N at mid of span.

g) Define polar moment of inertia and radius of gyration.

h) Define modulus of rigidity and modulus of elasticity.

i) Define section modulus.

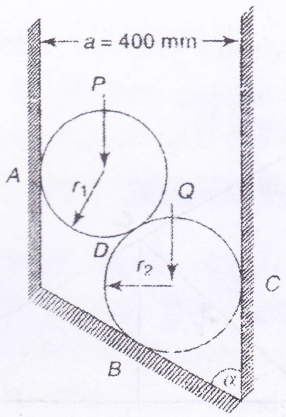
j) Write down the conservation of energy principle.

Section-B

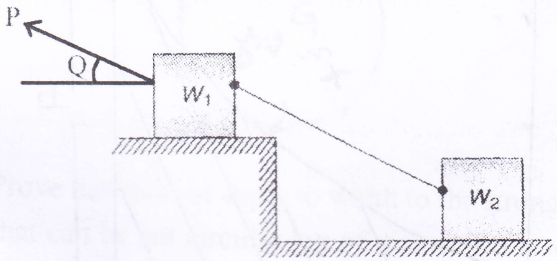
Q2. Attempt any five questions from this section. **(5×10=50)**

a) Two smooth cylinders of weight P and Q are placed in a smooth channel as shown in figure. Determine the reactions at contact surfaces A, B & C. The fol-

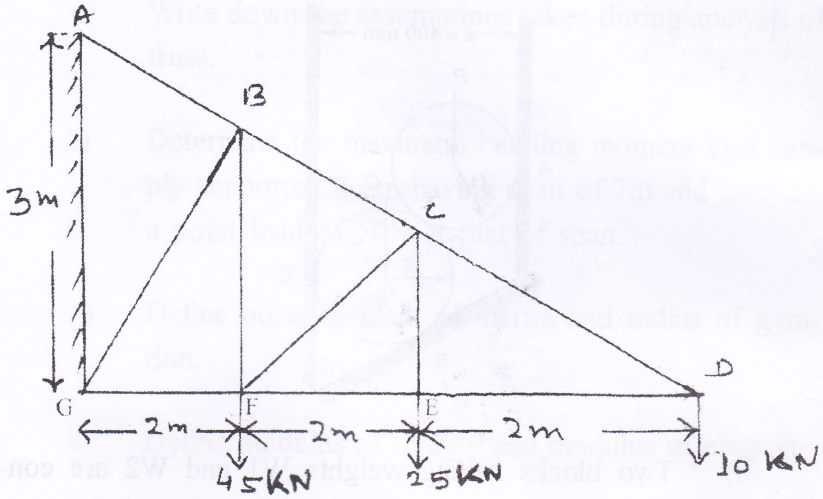
lowing numerical data are given: P=200N, Q=800N, r_1=100mm, r_2=200mm, and a=400mm, α=45°.



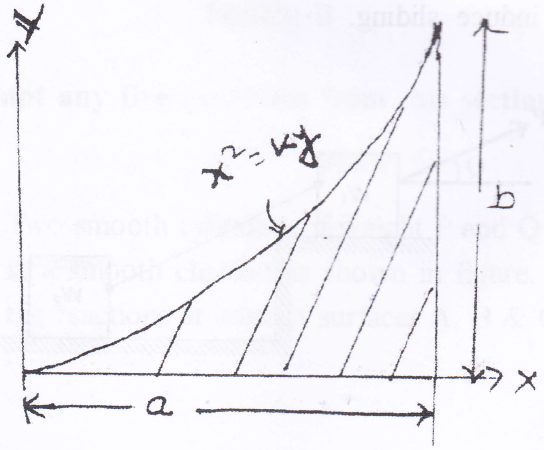
b) Two blocks having weights W1 and W2 are connected by a string and rest on horizontal planes as shown in figure. If the angle of friction for each block is φ, find the magnitude and direction of the least force P applied to the upper block that will induce sliding.



c) Analyze the truss as shown in figure. And find magnitude and nature of forces in each member of truss.



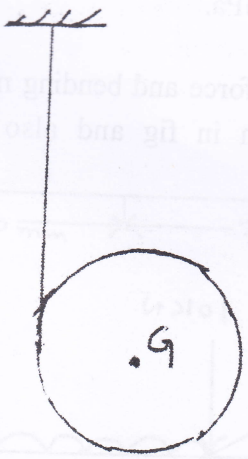
d) Determine the co-ordinates of the centroid C of the shaded area as shown in figure.



e) Derive the mass moment of inertia a sphere of radius R about centroidal axis.

f) The distance covered by a freely falling body in the last 1 second of its motion and that covered in the last but one second are in the ratio of 5:4. Calculate the height from which it strikes the ground.

g) A right circular cylinder of mass m' and radius'r'is suspended from a cord that is wound round its circumference. If the cylinder is allowed to fall freely, find acceleration of its mass centre G and tension in the cord.



h) Prove that ratio of depth to width to the strongest beam that can be cut circular log of diameter d is $\sqrt{2}$.

Section-C

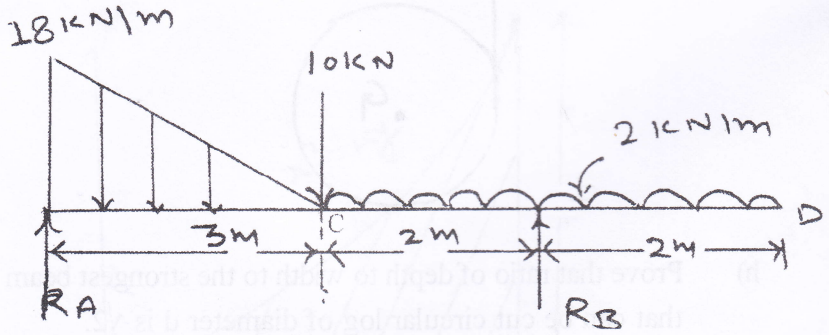
Attempt any two question from this section. **(2×15=30)**

Q3. What are the assumptions taken during derivation of torsion equation. Derive torsion equation

$$T/J = \tau/r = G\theta/L$$

Calculate the minimum diameter of a solid circular shaft which is not allowed to twist more than 2° in a 5m length when subjected to a torque of 12KN-m. Also calculate the maximum sharing stress developed. Take modulus of rigidity(G)=83 GPa.

Q4. Draw the shear force and bending moment diagram of the beam as shown in fig and also locate the point of contraflexture.



Q5. Calculate the moment of inertia of composite section as shown in figure about its centroidal axis.