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

Paper ID : 140111 Roll No. | | | | | | | | | | |

B.Tech

(SEM. I) THEORY EXAMINATION. 2015-16

ENGINEERING MECHANICS

[Time:3 hours] **[MaximumMarks:100]**

SECTION-A

1. Attempt **all** parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)

   (a) State the Lami's theorem.

   (b) State the assumptions made in the analysis of pin jointed trusses.

   (c) With the help of neat sketch explain the principle of transmissibility.

   (d) State the laws of dry friction.

   (e) Distinguish between centroid and centre of gravity.

   (f) State the perpendicular axis theorem.

   (g) Name various types of trusses.

   (h) Name various types of force system.

(i) Define the principle of virtual work.

(j) State the D'Alembert's principle.

SECTION-B

Attempt **any five** questions from this sections. (5x10=50)

2. (a) State prove the Varignon's theorem.

   (b) Explain and prove the Parallelogram law of forces.

3. Derive the expression for the relationship between tight side and slack side forces in a belt friction problem.

4. Find the forces in all the members of cantilever truss loaded 1000 N as shown in fig 1

5. Find the resultant and position of the resultant of a set of coplanar forces acting on a lamina as shown in Fig.2 Each square has side of 10 mm.

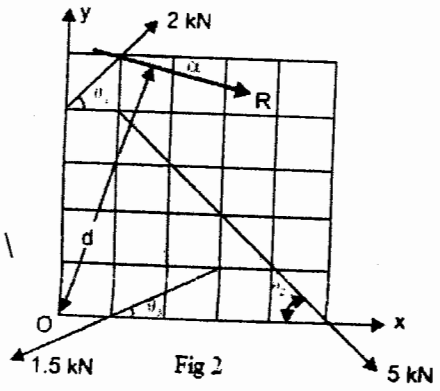

Fig 2

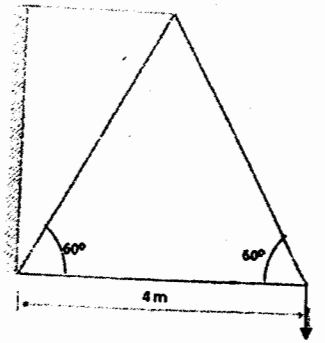

Fig 1 1000N

6. Derive an expression for mass moment of inertia for a sphere about its centroidal axis.

7. A bullet of 10 gm is fired into a body mass of 1Kg which is suspended by a string 1m long. The bullet is embedded in the body & due to impact, the body swings through an angle of 18.2°. Find the velocity of the bullet.

8. A uniform ladder weighing 200 N rests with its upper end against a smooth vertical wall andits foot on a rough horizontal ground making 60^0 angle with ground. Determine friction force of ground using method of virtual work.

9. A particle moves along a straight line and its motion is represented by the equation $s=16t+4t^2-3t^3$ where s in meters & t in seconds. Determine:(a) displacement, velocity & acceleration 2 seconds after start. (b) Displacement & acceleration when velocity is zero. (c) Displacement & velocity when acceleration is zero.

SECTION-C

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

10. (a) A uniform wheel weighing 20kN and 600mm diameter rests against 150mm thick rigid block as shown in fig a. Considering all surfaces to be smooth, determine(a) the least pull through the

centre of wheel to just turn the wheel over the corner of the block. (b) Reaction of the block as shown in fig 3.

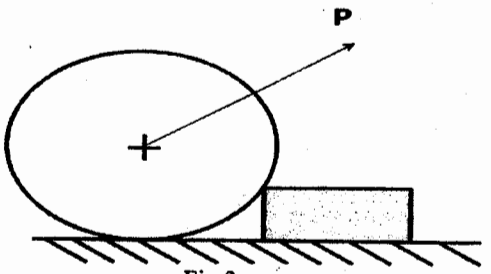

Fig 3

(b) Determine the moment of inertia of a circle of radius R about its centroidal axis.

11. Find the moment of inertia of I section shown in fig 4 about its centroidal axis.

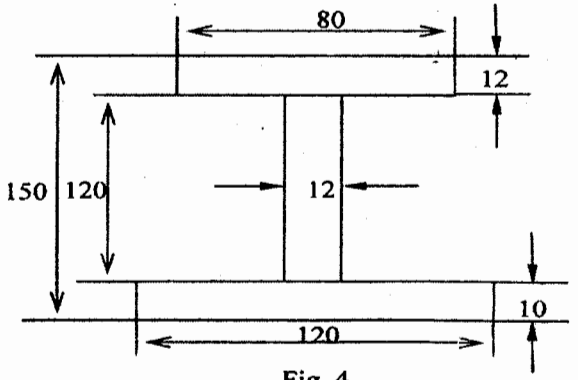

Fig. 4

12. Two blocks weighing 800 N and 200 N and connected by a thread, are pulled by 400 N forces on a rough horizontal surface as shown in Figure 5 given below. If coefficient of friction between blocks and plane is 0.3. Using D'Alemberts principle and also by using work energy principle determine acceleration of the blocks and tension in thread.

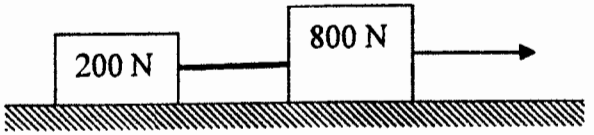

fig 5

—x—