

Reg. No: 

--	--	--	--	--	--	--	--	--	--



**MANIPAL INSTITUTE OF TECHNOLOGY**  
**(A Constituent College of Manipal University)**



Manipal – 576 104.

**FIRST SEMESTER B.E**

**END SEMESTER EXAMINATION NOV.2007/DEC. 2007**

**ENGINEERING MECHANICS CIE - 101**  
**(Revised Credit System)**

3-12-2007

TIME: 3 HRS.]

[MAX. MARKS: 50

**Note: 1. Answer any FIVE FULL questions.**

**2. Any missing data may be suitably assumed**

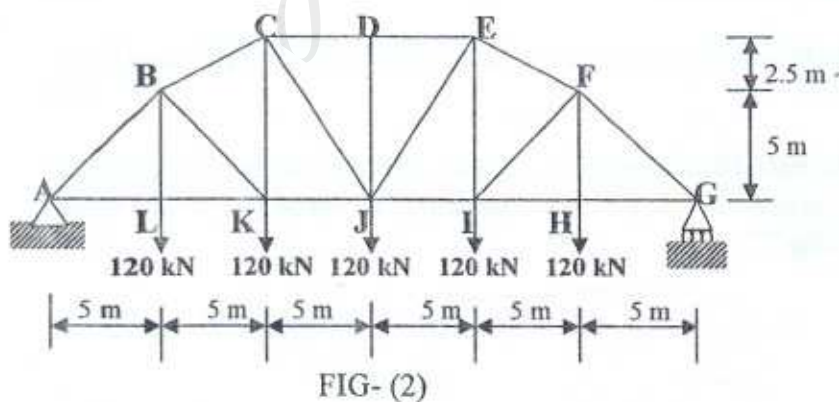
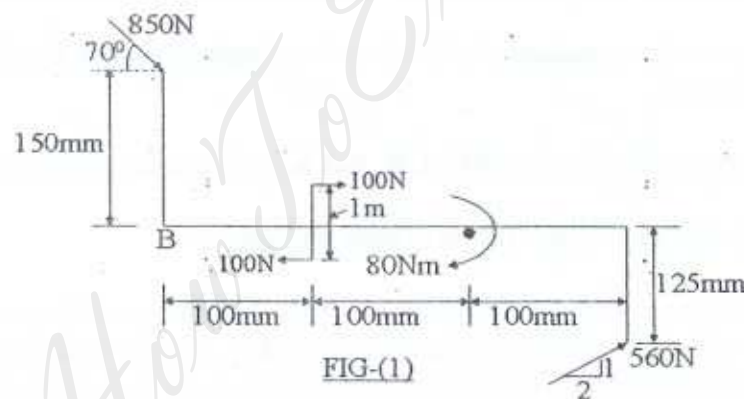
- 1(a) Explain the following (i) Free body diagram. (ii) Concept of rigid body. (04)
- 1(b) Locate the resultant of the force system shown in FIG-(1) w.r.t. point B. (06)
- 2(a) Define the terms (i) Coefficient of friction (ii) Angle of repose (iii) Total reaction (iv) Angle of friction. (04)
- 2(b) Find the force in the members BC, CK, and KJ of the truss shown in FIG-(2). (06)
- 3(a) Obtain work energy relation for rectilinear translation. (04)
- 3(b) A wagon weighing 400kN starts from rest, runs 30m down a 1% grade & strikes a post. If the rolling resistance of the track is 5N/kN, find the velocity of the wagon when it strikes the post. If the impact is to be cushioned by means of one bumper spring, which compresses 1 mm per 20 kN weight, determine how much the bumper spring will be compressed (06)
- 4(a) Determine the magnitude and direction of resultant of three forces  $F_1, F_2$  and  $F_3$  as shown in FIG-(3).. (05)
- 4(b) In the system shown in FIG-(4) the pulley is smooth and the coefficient of friction between the other contact surfaces is 0.2. Find the magnitude of force P that will cause motion to the right impending. (05)

5(a) A 1000N block moves up the plane when a 1500N force is applied on the block parallel to the plane which is inclined at  $20^\circ$  with the horizontal. If the coefficient of friction between the block and the plane is 0.4, determine the time required by the block to attain a velocity of 30m/sec starting from rest. If 1500N force is then removed, determine the time up to which the block continues to move before changing the direction. Use Impulse-Momentum principle. (05)

5(b) An elevator weighing 5000 N is raised by a shaft by means of a cable wound round the drum at the top of the shaft. The motion of the elevator is as follows. Accelerated uniformly from rest to 2 m/sec in the first 5 m; constant speed for the next 20 m and decelerated uniformly to rest in a further 10m. Using D'Alembert's principle, compute  
 i. The tension in the cable and  
 ii. The time of journey during each stage (05)

6(a) Three perfectly elastic balls A, B, C of weights 4N, 12N and 24N are moving in the same direction with velocities 6m/s, 2m/s and 1m/s respectively. The ball A strikes the ball B which in turn strikes the ball C. Calculate the velocities of the balls immediately after the collision. (05)

6(b) Find the position with respect to O, of circular hole of radius 50mm. to be made in a circular plate of radius 200 mm such that the C.G. of the plate is located as shown in Fig-(5). (05)



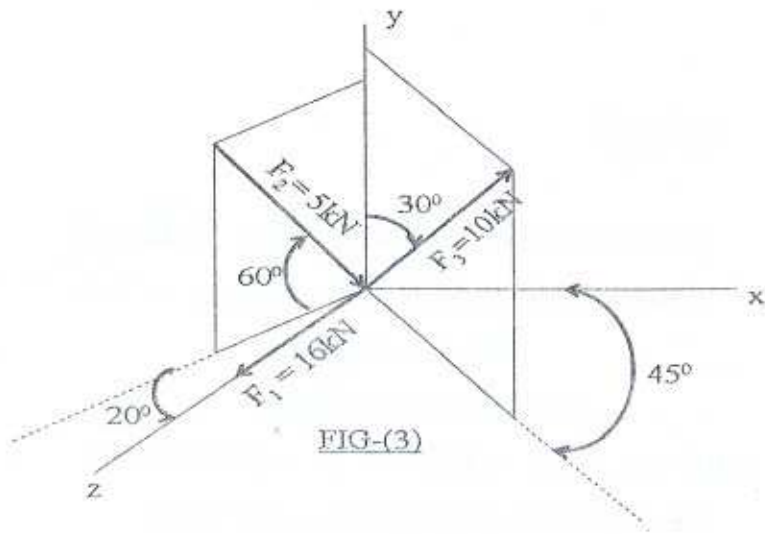


FIG-(3)

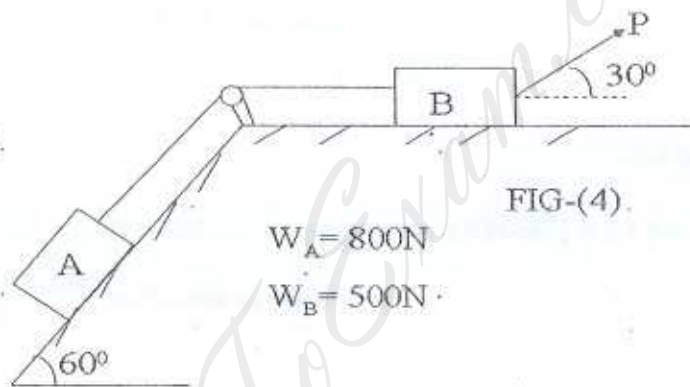


FIG-(4)

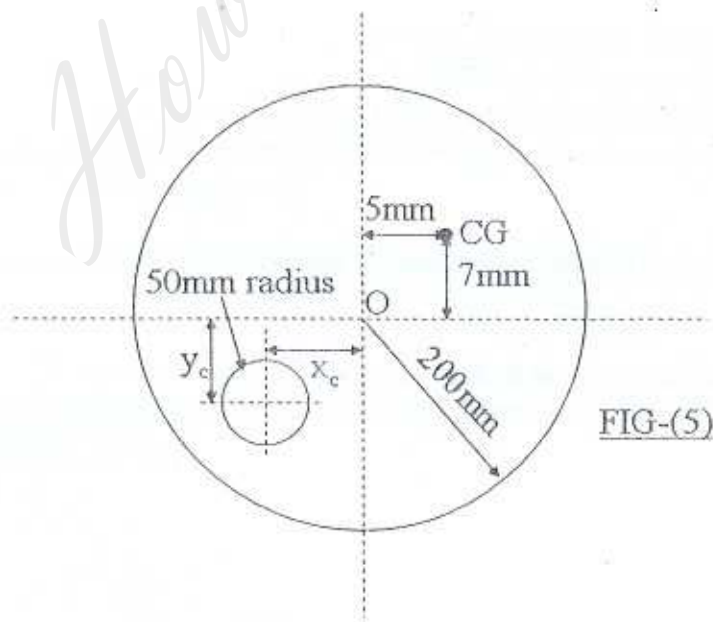


FIG-(5)