Menoufia University
Faculty of Engineering-Shebin Elkom
Prod. Eng. & Mech. Design Department
First Semester Examination-2013/2014
Date of Exam: 12/1/2014

Subject: Applied Mechanics
Code : PRE 117
Year : First Elect.Department
Time Allowed : 3 hours
Total Marks : 60 marks

Answer all the following questions:

Question No.1 (14 marks)

Draw the shear force and bending moment diagrams for the beam shown in Fig.(1)

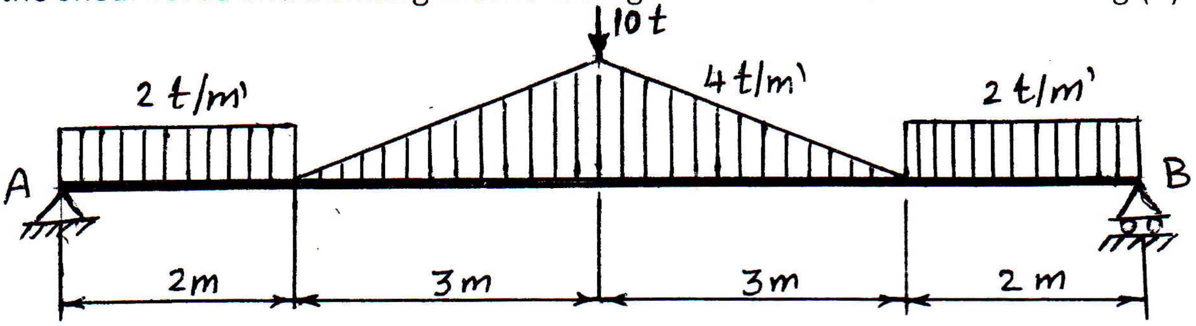

Fig. 1

Question No.2 (12 marks)

Sphere A has a mass of 25 kg and a radius of 60 mm, while sphere B has a mass of 5 kg and a radius of 30 mm. If the spheres are traveling initially along the parallel paths with the speeds shown in Fig. 2, determine the velocities of the spheres immediately after impact. The coefficient of restitution is 0.8 and friction is neglected.

Question No. 3 (12 marks)

An airplane flies horizontally at velocity v_o = 250 km/hr when two parachutists jump out horizontally as shown in Fig.3 . Parachutist A weighs 800 N and pushes against the airplane vith 1000 N force applied for 0.3 sec. Parachutist B weighs 900 N and jumps shortly after A, pushing with 1200 N force for 0.25 sec. What will be the final linear momentum of the airplane which weighs 50000 N without two parachutists.

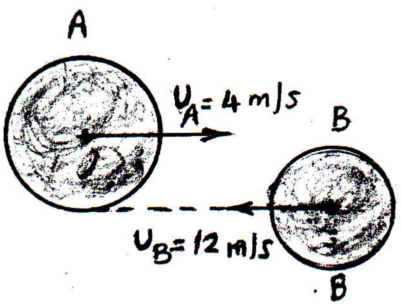

Fig 2

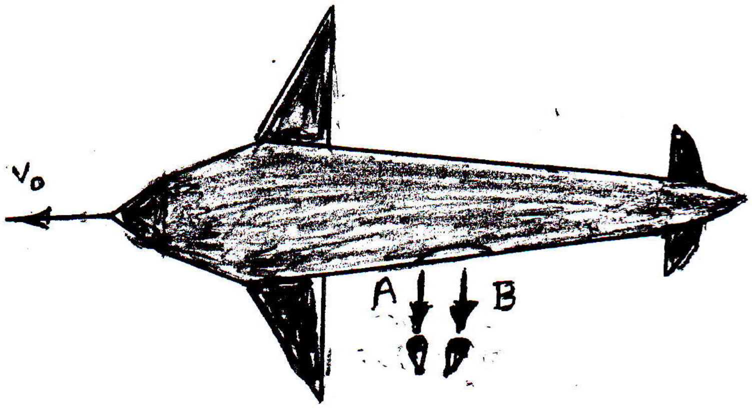

Fig. 3

Question No. 4 (12 marks)

In the mechanism shwn in Fig. 4, the piston B is moving to left with a velocity of 0.8 m/s and an acceleration of 10 m/s^2 . Determine :

i) the angular velocity and angular acceleration f the crank OA, and

ii) the velocity of the piston C.

Given : OA= 50 mm, AB=AC= 160 mm .

Question No. 5 (10 marks)

A stepped disk of mass M=20 kg is attached to three springs of K=100 N/m and two dampers of C=20 N.sec/m and mass (m) of 2 kg is holding with inextended cord as shown in Fig. 5. The radius of gyration of the disk is 0.3 m. What is the equation of motion for the system if the mass (m) is displaced with initial amplitude x and hence the disk is rotated a small angle 0, in clockwise direction, and then released. Find also the natural frequency of the system.

Given: R_1 = 0.25 m and R_2 = 0.4 m .

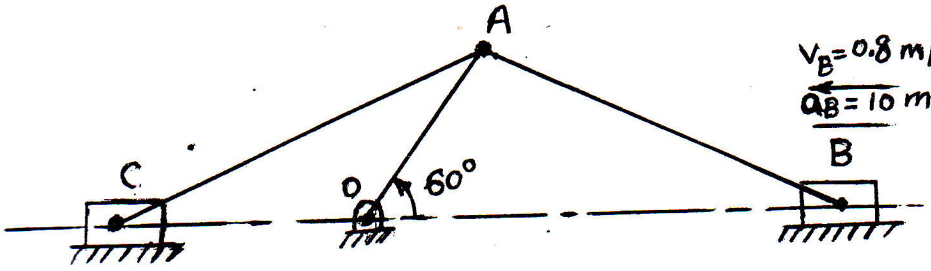

Fig. 4

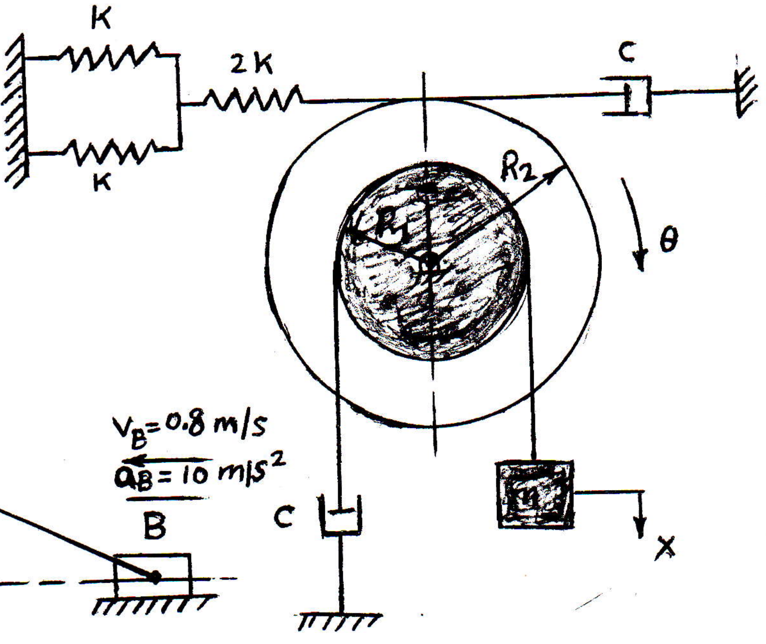

Fig. 5

GOOD LUCK

With our best wishes

This exam measures the following ILOs															
Question Number	Q2	Q3	Q4	Q5		Q1					Q5				
Skills	a15-2	a1-1	a15-2	a15-2		b17-1					c13-1				
	Knowledge &Understanding Skills					Intellectual Skills					Professional Skills				