Menoufia University

Faculty of Engineering-Shebin Elkom

Prod. Eng. & Mech. Design Department

First Semester Examination-2014/2015

Date of Exam: 14/1/2015

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)

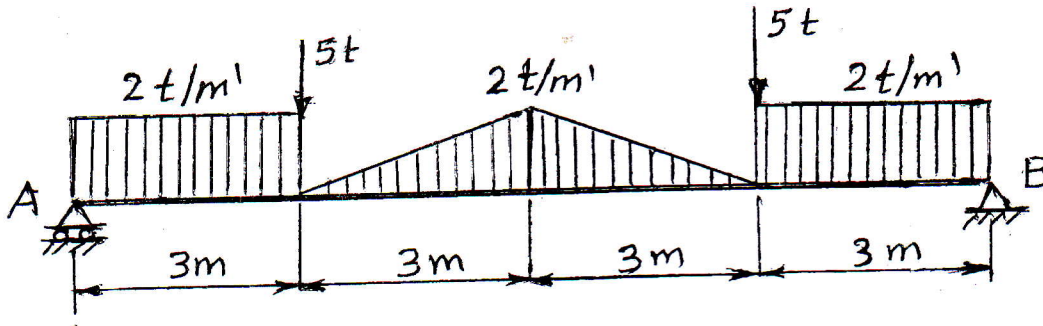Draw the shear force and bending moment diagrams for the beam shown in Fig.(1).

Fig. 1

Question No.2 (12 marks)

The partical shown in Fig.(2) is of mass 20 kg and moving in a horizontal straight line with a Initial velocity of 10 m/s. An upward force F_v functioning in time is applied to it in a direction normal to the initial direction of motion. If the force F_v varies according to the graphical representation shown in Fig.(2). Determine the velocity of the partical when t=4 sec and its direction with respect to the force F_v . Suppose that the force does not change its directin .

Question No. 3 (12 marks)

Two smooth spheres A and B have initial velocities just before they collide as shown in Fig.(3). If they have masses m_A=5 kg and m_B=10 kg, determine their velocities just after impact, and Also find the loss in kinetic energy due to the impact if the coeffient of restitution e=0.6 .
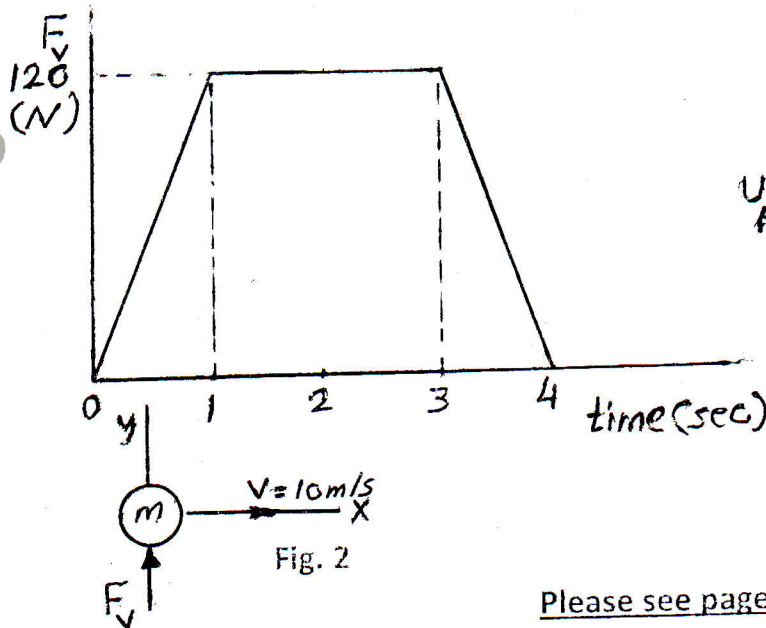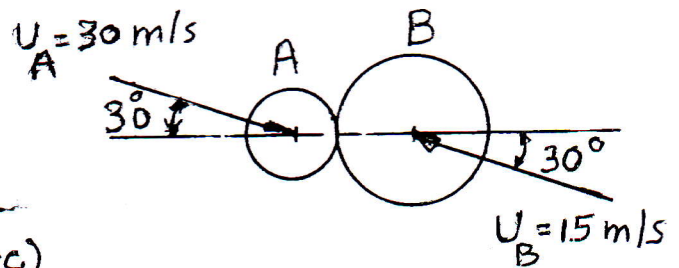

Fig. 2

Fig. 3

Please see page no. 2

(1)

Question No. 4 (12 marks)

For the mechanism shown in Fig.(4), the crank OA rotates about a pin O with a constant angular speed of $\omega = 30$ rad/s (in clockwise direction). If the length of the crank OA=6 cm and the connecting rod AB=18 cm , calculate the velocity and acceleration of the piston B.

Question No. 5 (10 marks)

A stepped disk, of mass M=30 kg and its radius of gyration 0.5 m, is attached to three springs of stiffnes K=1000 N/m each and a damper of C=50 N.sec/m and mass (m) of 5 kg is holding with inextended cord as shown in Fig.(5). 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 θ, in clockwise direction, and then released. Find also the natural frequency of the system.
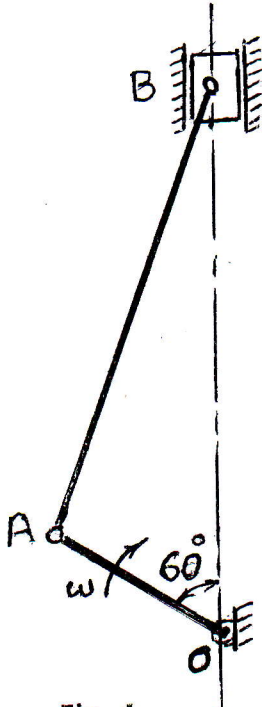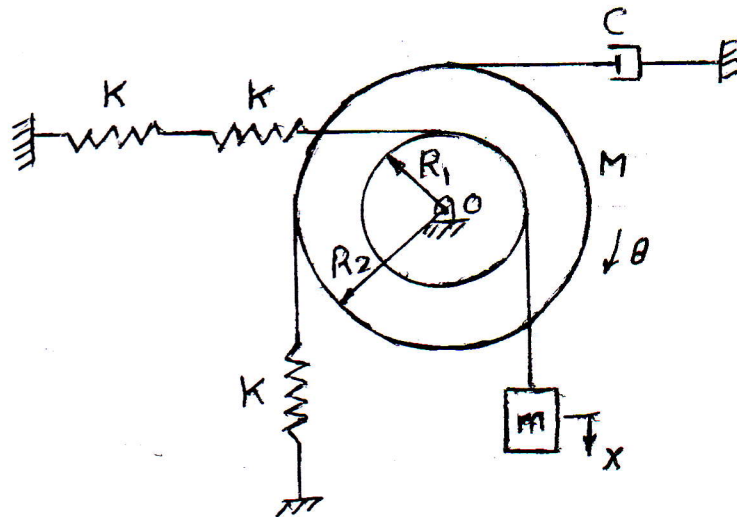
Given: $R_1 = 0.4$ m and $R_2 = 0.6$ m .

Fig. 4

Fig. 5

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	This exam measures the following ILOs										
Question Number	Q_2	Q_3	Q_4			Q_1				Q_5	
Skills	a 15-2	a 1-1	a 15-2			b 17-1				Q_5 C 13-1	
	Knowledge &Understanding Skills					Intellectual Skills				Professional Skills	