#### Menoufia University

Faculty of Engineering-Shebin Elkom

Prod. Eng. & Mech. Design Department

First Semester Examination-2017/2018

Date of Exam: 14/1/2018



Subject: Applied Mechanics

Code: PRE 117

Year: First Elect.Department

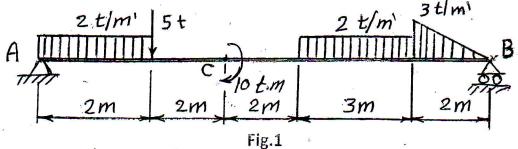
Time Allowed: 3 hours
Total Marks: 60 marks

### This exam measures the following ILOs (a1,a2,a3,b1,b2,b3,c1,c2,c3)

Answer all the following questions:

### Question No.1 (12 marks)

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



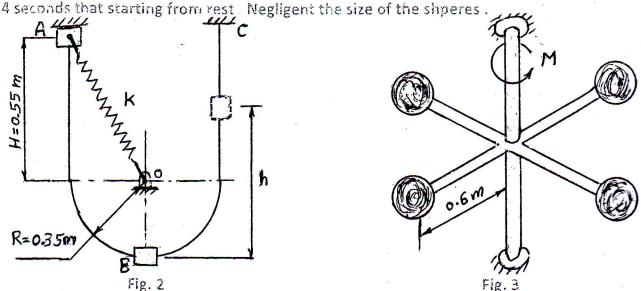
### Question No.2 (10 marks)

ABC is a vertical smooth wire as shown in Fig.2 . The ring A of mass  $m_A$ = 0.25 kg is attached with a spring of stiffness k= 300 N/m and unstretched length of 0.45 m. If the ring A is released from rest at the position shown to strike another ring B of mass  $m_B$  =0.15 kg, which at rest, determine :-

- a) The velocity of the ring A just before impact with the ring B
- b) The velocity of the ring B after the impact if the coefficient of restitution e= 0.85
- c)The maximum height, h, reached by the ring B after the impact

# Question No. 3 (8 marks)

The four shperes each of masse 20 kg are rigidly attached to the cross bar frame having a negligible weight. If a couple moment  $M=0.5\,t^3+0.8\,t^2+0.6\,t$  N.m., where t is time in seconds, is applied as shown in Fig.3, determine the speed of each of the shperes in



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# Question No. 4 (12 marks)

The disk in the mechanism shown in Fig.4 rotates with an angular velocity  $\omega=2$  rad/s in counter-clockwise and an angular acceleration  $\alpha=6$  rad/s² in the same direction of  $\omega$ . Determine the angular acceleration of the links AB and BC at this instant, where OA and BC are in vertical position .

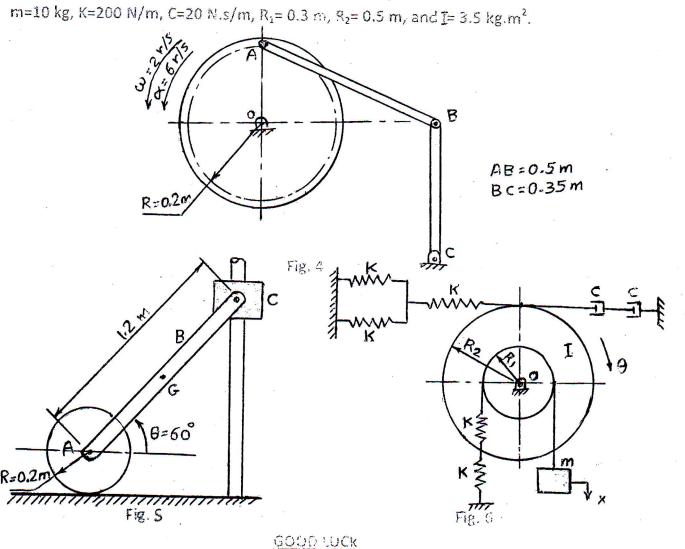
# Question No. 5 (10 marks)

The system shown in Fig.5 consistis of a 100 N disk (A) that is attached to a uniform 50 N rod (B) and a 10 N smooth collar (C). If the assembly is release from rest when  $\theta = 60^{\circ}$ , determine the angular velocity of the rod when  $\theta = 0^{\circ}$ . Assume the disk roll without slipping. Neglect the friction along the vertical guid of the collar and the collar (C).

# Question No. 6 (8 marks)

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For the free vibratory system shown in Fig.6, drive the equation of motion and then compute the natural frequency of the system. Given:



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