Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VII SEMESTER B.TECH (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: THEORY OF VIBRATIONS [AAE- 401]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A. For the system shown in figure 1, Draw the free body diagram when the mass m is displaced and write the fundamental differential equation of motion. **(05)**

1B. In the system shown in figure 1, if the damper is critically damped, find the solution of the equation of motion. **(05)**

2A. The U-tube manometer is used to measure the pressure in a pipe. If the pipe pressure is suddenly reduced to atmospheric (the gauge pressure reduced to zero), determine the frequency of oscillation of the fluid in the manometer about its equilibrium configuration if the total length of the manometer fluid is *L* and the tube is uniform **(03)**

2B. What is logarithmic decrement? Derive an equation for the same. **(03)**

2C. Plot the graph of transmissibility v/s frequency ratio and comment on the results. **(04)**

3A. A car has a natural frequency of vibration of 110 CPM. It travels on a road, the surface of which is assumed to be sinusoidal profile with a distance of 0.1 m between the peak and the depression. The distance between the two peaks measured horizontally is 0.3 m. Assuming the car to be a single degree of freedom system with damping ratio of 0.2 for shock absorbers, determine the maximum amplitude of vibration of the car when the car travels at a speed of 40 kmph **(05)**

3B. A rotor having a mass of 5 kg is mounted midway on a 1 cm diameter shaft simply supported at the ends by two bearings. The bearing span is 40 cm. Because of certain manufacturing inaccuracies, the C.G. of the disc is 0.02 mm away from the geometric centers of the rotor. If the system rotates at 3000 rpm, find the amplitude of steady state vibrations and the dynamic force transmitted to the bearings. Neglect damping **(05)**

4A. Define the following: damping factor, semi-definite systems, Transmissibility and Magnification factor. **(04)**

4B. Determine the natural frequencies of the system shown in fig.2. (m_1=13.4 kg and m_2 =6.7 kg) **(06)**

5A. Find the Flexibility influence coefficient matrix for the system shown in fig.3. **(05)**

5B. Find the natural frequencies of the system shown in fig.4. Using Eigen value method.(Assume $K_1=K_2=K_3$=1 N/m and $m_1=m_2=m_3$= 1kg) **(05)**

6A. Define the following : (i) Definite systems (ii) Semi definite systems **(02)**

6B. Determine the natural frequencies of the system using Holzer's method. (start with ω=0.25, take interval of 0.25) **(08)**

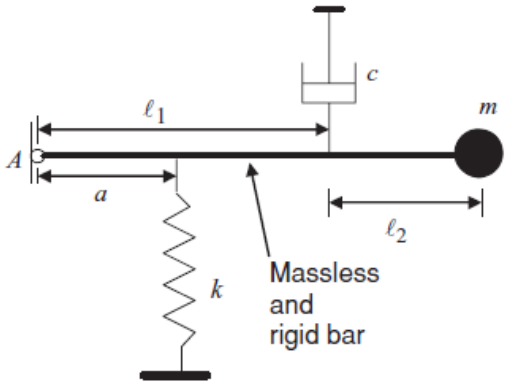

FIG.1.

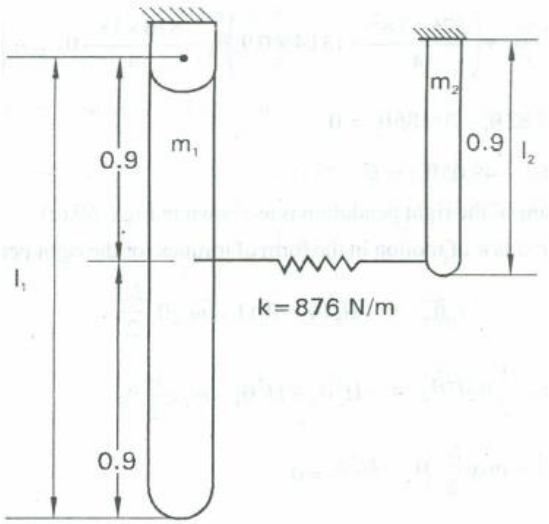

FIG.2.

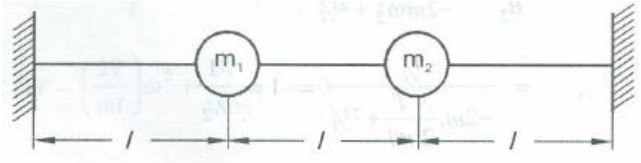

FIG.3.

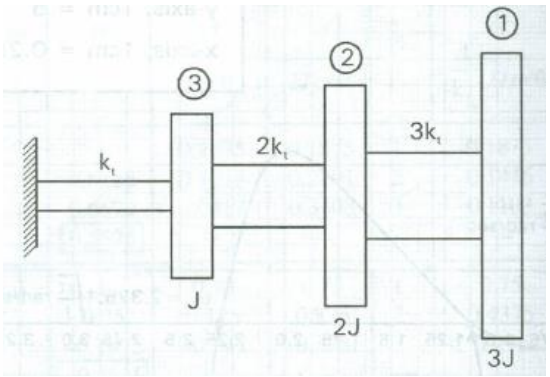

FIG.4.