Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2017

SUBJECT: VIBRATIONS AND ACOUSTICS [AAE -5102]

REVISED CREDIT SYSTEM

(18/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

1A. During the installation of 4 pole 50 cycle induction motor of mass 250 kg, it is determined by means of a level that the deflection of the foundation under the motor is 0.12mm. Would you consider the foundation to be safe? Justify your answer. **(03)**

1B. A mass of 1 kg is supported on a spring of stiffness 9800 N/m. The damping coefficient is 5.9 N-sec/m. Determine the natural frequency of the system. Find also the logarithmic decrement and amplitude after three cycles if the initial displacement is 0.3 cm. **(05)**

1C. Briefly explain why manual sweep of the frequency is better than sine sweep in forced vibration tests? **(02)**

2A. Derive the equation of a simple pendulum for small angular displacement. Derive the equation for the same if the amplitude is very large. **(05)**

2B. Briefly explain the principle of LVDT with sketch. **(03)**

2C. Explain the working principle of an accelerometer. **(02)**

3A. Consider the free vibration of the system, where $\ddot{x}+2\xi\omega_n\dot{x}+\omega_n^2 x=0$ ξ=0.2 and ω_n=0.8. Plot the solutions of displacement against time and velocity against time. **(05)**

3B. What are stationary random process and Ergodic process? **(03)**

3C. Differentiate between absolute and relative measuring instruments. **(02)**

4A. With neat sketch briefly explain the principle of Electret capacitor microphone **(03)**

4B. Explain the method isoclines. **(02)**

4C. The equation of a non-linear system is give by the equation $m\ddot{x}+\frac{l}{2}\left(T_o+\frac{AE}{2l}x^2\right)x=0$ .Determine the solution using Perturbation method. **(05)**

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5A. Differentiate between free-field and pressure-field microphones. **(02)**

5B. Derive the equation for the lateral vibrations of a cantilever beam using continuous system approach. **(05)**

5C. Briefly explain the theory of self-excited oscillations. **(03)**