METROLOGY AND INSTRUMENTATION – TEST I

Time: 60minutes Marks: 3X5+3X5=30maximum

1. There have been claims in the press that Coconut Oil reduces the wear rate of an engine cylinder and you are asked to investigate the same. Explain how you will design and analyze an experiment according to the procedure recommended by Montgomery.
2. Classify the various types of waveforms and give examples for each.
3. Explain with the aid of sketches how the magnitude ratio and frequency response curves vary for the case of a sinusoidal input function to a first order system.

4. A pressure gauge has the following specifications: Range 0-100MPa, Linearity error 0.10% of reading, Hysteresis error 0.2% FSO, Repeatability error 0.05% FSO. Estimate the overall error if the reading shown is 80MPa.

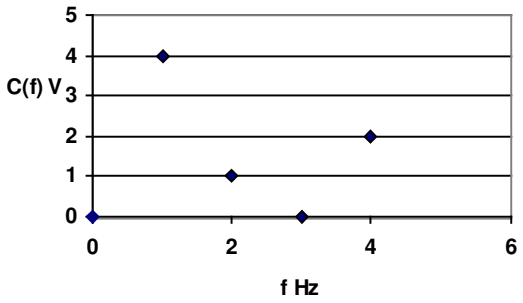
OR

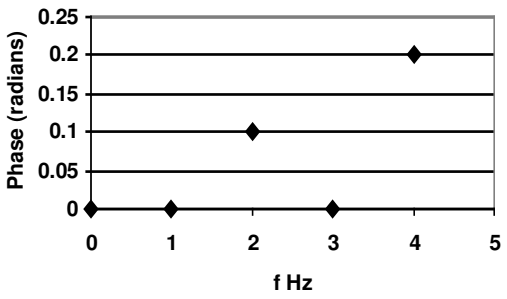
5. Define the unit of mass in the SI system. How was it defined in the 18th century?

6. The temperature in a room varies from 20^{o}C at 9:00 hours to 25^{o}C at 15:00 hours, back to 20^{o}C at 21:00 hours and then down to 15^{o}C at 3:00 hours the next day. Make suitable assumptions and express the temperature as a function of time in hours using a Fourier series. What is the fundamental frequency in Hz?

OR

7. Express the signal represented by the amplitude spectrum and phase shift diagram given below in the form of a Fourier series:





8. A thermometer uses a fluid of specific gravity 13.6 and has a time constant of 15 seconds. After keeping in air at 30^{o}C for a long time, it is suddenly dipped into boiling water. What will be the temperature indicated by the thermometer after 30seconds of dipping?

OR

9. A seismic transducer having a range of 0-100 μm is used to measure a vibration, which has an amplitude of 50μm and frequency of 720Hz. Determine the error in the magnitude of the steady state output of the instrument, if it has a damping ratio of 0.8 and a natural frequency of 640Hz.