Manoura University
Faculty of Engineering
Building & Construction Engineering Program
Fall Semester 2014/2015
Course Title: Physics-1
Course Code: *PHYS011*

Final Exam (50%)
Time: 2 hours
Date : 10th January 2015

Answer All Questions

Questions No. 1: (13 Marks)

1-a) Write down the dimensions of the following physical quantities:, (i) stress, (ii) power and (iii) quantity of heat. (3 Degrees)

1-c) Plot the kinetic energy, potential energy and total energy of simple harmonic motion versus the distance, x from the equilibrium position. (2 Degrees)

1-c) A steel wire of 3 m long has cross sectional area 0.1 cm^2. The wire is hung by one end from a support structure, and a 100 kg machine is hung from the wire's lower end. Determine, (i) the stress, (ii) the strain and (iii) the elongation of the wire. Take the Young's modulus of steel is 200 GPa. (4 Degrees)

1-d) A mass is attached to a spring of constant 100 N/m. It is stretched with 6 cm and then released to oscillate as a simple harmonic motion. Find, (i) the potential energy, (ii) kinetic energy and (iii) total energy at a distance 4 cm from the equilibrium position. (4 Degrees)

Questions No. 2: (12 Marks)

2-a) Consider the two equations of transverse travelling waves as:

$y_1 = 0.04 \sin (2x - 40t)$ m, $y_2 = 0.04 \sin (2x - 40t + 0.5)$ m

For the resultant wave $y = y_1 + y_2$, find (i) the amplitude, (ii) the wave length, (iii) the time period and (iv) the speed. (4 Degrees)

2-b) If the sound level of sound waves increases by 10 dB, what is the ratio of the final intensity to the initial intensity I?

2-c) An ambulance, travels down a highway at a speed of 40 m/s, sounds a siren of 500 Hz. What frequency heard by a car driver travelling at 25 m/s in the opposite direction of the ambulance in the two cases: (i) approach each other and (ii) pass and move away from each other. Take the velocity of sound in air 340 m/s.

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Questions No. 3: (13 Marks)

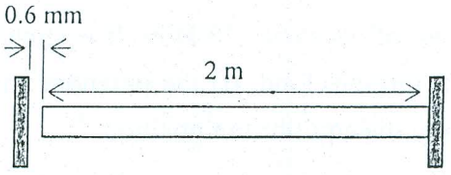
3-a) Write down the basic idea for making (i) liquid thermometer, (ii) constant volume gas thermometer, (iii) bimetallic thermometer and (iv) resistance thermometer.

(4 Degrees)

3-b) Draw the heating curve of water. (2 Degrees)

3-c) Express only without proving the work done by an ideal gas during the following processes:, (i) constant volume process (ii) constant pressure process and (iii) isothermal process. (3 Degrees)

3-d) A steel rod 2 m long is fixed from one end at a temperature of 20 °C as in the figure shown below. If the gap between the free end of the rod and the wall is 0.6 mm, what is the type and magnitude of the stress at 40 °C. The thermal expansion coefficient for steel $\alpha = 12\times10^{-6}\ ^{\circ}C^{-1}$ and Young's modulus is 2×10^{11} Pa. (4 Degrees)



Questions No. 4: (12 Marks)

4-a) How much heat is needed to convert 20 g of water at 30 °C to steam at 150 °C. Take the specific heats for water is 4186 J/kg °C and for steam is 2100 J/kg °C, and the latent heat of vaporization for water 2.26×10^{6} J/Kg. (4 Degrees)