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

Final Exam (50%)
Time: 2 hours
Date : 15th June 2015

Answer All Questions

Questions No. 1: (13 Marks)

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

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

1-c) A steel rod of 10 cm long has cross sectional area 2 cm^2. A tensile force of 8000 N is applied to the rod. Determine, (i) the stress, (ii) the strain and (iii) the elongation of the rod. Take the Young's modulus of steel is 200 GPa. (4 Degrees)

1-d) A mass is attached to a spring of constant 200 N/m. It is stretched with 5 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:

$y_1 = 0.05 \sin (4x - 20t)$ m, $y_2 = 0.05 \sin (4x - 20t - 0.5)$ 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 decreases by 30 dB, what is the ratio of the final intensity I_1 of the waves to their initial intensity I_2? (3 Degrees)

2-c) An ambulance travels down a highway at a speed of 33 m/s, sounding a siren at a frequency of 600 Hz. What frequency heard by a bus driver travelling at 20 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. (5 Degrees)

Please turn over

Questions No. 3: (10 Marks)

3-a) Write down the basic idea for making (i) constant volume gas thermometer and (ii) bimetallic thermometer. (2 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 is fixed from its both ends at a temperature of 20 ^{o}C. If its temperature is decreases to - 10 ^{o}C, what is type and magnitude of the stress delivered in the rod. The thermal expansion coefficient for steel $\alpha = 12\times10^{-6}$ $^{o}C^{-1}$ and Young's modulus is 2×10^{11} Pa. (3 Degrees)

Questions No. 4: (15 Marks)

4-a) How much heat is needed to convert 20 g of ice at -20 ^{o}C to a water at 25 ^{o}C. Take the specific heats for water is 4186 J/kg ^{o}C and for ice is 2100 J/kg ^{o}C, and the latent heat of fusion of ice is 3.334×10^{5} J/Kg. (4 Degrees)

4-b) A glass window of thickness 6 mm has a face area of 2 m^2 and thermal conductivity of 0.8 W/m.K. If the temperature difference between its faces is 15 ^{o}C , how much heat is conducted through the window in one hour. (4 Degrees)

4-c) A thin square plate of length 20 cm on a side is maintained at 100^{o}C. How much total power radiated by this sheet. Take Stefan's constant 5.67×10^{-8} W/m^2K^4. Assume the plate behaves like black body. (3 Degrees)

4-d) [illegible] work each cycle. (i) How much heat that is rejected to the cooled reservoir in one cycle? (ii) If its cooled reservoir is at 10 ^{o}C, find the temperature of its hot reservoir. (4 Degrees)