## Mid-West University
## Examinations Management Office
### End-Semester Examinations -2080

Bachelor level / B.E. Computer / 2nd Semester      Full Marks: 50
Time: 3 hours      Pass Marks: 25
**Subject: Engineering Physics (SH422/SH504)**

- *Attempt all the questions*
- *Figures in the margin indicate full marks.*
- *Assume suitable values, with a stipulation, if necessary.*
- *Candidates are required to answer the questions in their own words as far as possible.*

1. a) Define reverberation time. Derive the Sabine formula for reverberation time. **(5)**

   b) What resistance should be connected in series with an inductance of 220mH and capacitance of 12μF for the maximum charge on the capacitor to decay to 95% of its initial value in 50 cycles? **(3)**

   c) A simple harmonic wave is traveling in a gas in a positive X-axis. Its amplitude is 2cm, velocity is 45m/s, and frequency is 75 per second. Find the displacement of the particle of the medium at a distance of 135cm from the origin in the direction of a time t=3sec. **(2)**

2. a) Define dipole. Find the expression of the electric field due to dipole at a point on the equatorial line. **(5)**

   b) Two thin lenses of focal lengths $f_1$ and $f_2$ separated by a distance d have an equivalent focal length of 50cm. The combination satisfies the conditions for no chromatic aberration and spherical aberration. Find the values of $f_1$, $f_2$, and d assume that both the lenses are of the same material. **(5)**

3. a) Differentiate between constructive and destructive interference. Show that fringe width for dark, and bright fringes are equal in Young's double slit experiment in interference. **(5)**

   b) The distance between the first and fifth minima of a single slit diffraction pattern is 0.35mm with the screen 40cm away from the slit, when light of wavelength 550nm is used. i) Find the slit width. ii) Calculate the angle of the first diffraction minima. **(2.5)**

   c) Find the thickness of a quarter wave plate when the wavelength of light is 5850 $A^o$. the refractive index for e-ray and o-ray are 1.565 and 1.544 respectively. **(2.5)**

4. a) What do you mean by quantization of energy? Derive the de-Broglie wavelength of the electron.

   Normalize the one-dimensional wave function $\psi = \sin\left(\frac{\pi x}{a}\right), 0 < x < a$ and $0,$   $Outside$ **(1+2+2)**

   b) Derive the equation of continuity. Show that the velocity of electromagnetic waves is equal to the velocity of light in free space. **(2+3)**

5. a) Show that $J=\sigma E$, where symbols have usual meaning. Explain the atomic view of resistivity. **(5)**

   b) A circular coil of radius 5cm carries a current 30A. Calculate the magnetic field at the center due to one-sixth part of the coil. (Givn, $\mu_0 = 4\pi \times 10^{-7} N/A^2$ ). **(2.5)**

   c) A copper strip 2cm wide and 1mm thick is placed in a magnetic field of 1.5T. If a current of 200A is set up in the strip. Calculate hall voltage and hall mobility. (Given, $n=8.4 \times 10^{28}$ $m^{-3}$ and $\rho=1.72 \times 10^{-8}$ ohms/m). **(2.5)**

**The End**