※ 考生請注意：本試題 ☑可 □不可 使用計算機

1. (20 pts) A satellite of mass m moves in a circular orbit of radius r about a planet of mass M, where $M \gg m$. Give the total energy of the system.

2. (20 pts) Three charges lie along the x-axis. The positive charge $q_1 = 15\mu C$ is at $x=2$, and the positive charge $q_2 = 6\mu C$ is at the origin, i.e., $x=0$. Where must a negative charge, q_3, be placed on the x-axis so that the resultant force on it is zero?

3. (20 pts) The average speed of the charge carriers is called the drift speed. A copper wire of cross sectional area $3 \times 10^{-6} m^2$ carries a current of 10A. Find the drift speed of the electrons in the wire. The density of copper is $8.95 g/cm^3$

4. (40 pts) A plane electromagnetic sinusoidal wave of frequency 40 MHz travels in free space in the x direction. At some point and at some instant, the electric field E has its maximum value of 750 N/C and is along the y axis. Answer the following questions.

   (a) (10 pts) Determine the wavelength and period of the wave.
   (b) (10 pts) Calculate the magnitude and direction of magnetic field B when E=750 N/C in the positive y-direction.
   (c) (20 pts) Write expressions for the space-time variation of the electric and magnetic field components for this wave.