Diploma in Civil Engineering (DCLE(G)/ Diploma in Mechanical Engineering (DME) DCLEVI/DMEVI/DELVI/DECVI/DCSVI/ ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

December, 2013

BET-012 : PHYSICS

Time : 2 hours   *Maximum Marks : 70*

Note :   Question No. 1 is **compulsory.** *Attempt* **any four** *questions from the question* **No.** *2 to 8. Use of scientific calculator is* **permitted.**

1. (a) Young's modulus of a material has the same unit as :   **7x2=14**
        (i)   pressure   (ii) strain
        (iii) compressibility (iv) force
    (b) A needle floats on the surface of water because of :
        (i)   lighter weight
        (ii) adhesive force
        (iii) viscosity
        (iv) surface tension
    (c) The root mean square (r.m.s) speed of gas molecule is given by :

    (i) $\dfrac{3}{2}\sqrt{\dfrac{k_B T}{m}}$ (ii) $\sqrt{\dfrac{3\,k_B T}{m}}$

    (iii) $\dfrac{2}{3}k_B T$ (iv) $\dfrac{1}{3}\sqrt{\dfrac{k_B T}{m}}$

(d) Luminous flux is defined as :
  (i) amount of energy (electromagetic) emitted per second by a source.
  (ii) amount of electromagnetic energy emitted per hour by a source.
  (iii) amount of electromagnetic energy absorbed per second by a surface.
  (iv) amount of electromagnetic energy received per second by a surface.

(e) If the distance between two charges is doubled, the force between the charges will be :
  (i) four times more
  (ii) four times less
  (iii) will increases two times
  (iv) will decrease two times.

(f) The permeabilities of para and ferromagenetic materials are :
  (i) greater than unity and large
  (ii) less than unity
  (iii) equal to unity
  (iv) negative

(g) The material of wire of Potentiometer is :
  (i) copper   (ii) steel
  (iii) manganin   (iv) Aluminium

2. (a) What is surface energy ? Find a relation between surface tension and surface energy.   5

(b) State and explain Hooke's law.   4

(c) When a solid rubber ball is taken from the surface to bottom of a lake its volume decreases by 0.0012%. The depth of the lake is 360m. density of the lake water is 10^3 kg m^{-3}. Calculate the bulk modulus of rubber. $(g = 10ms^{-2})$ 5

3. (a) State the assumptions of kinetic theory of gases.   5

    (b) What is black body ? What are the characterstics of a black body ?   4

    (c) A mass of 5kg falls through a height of 40m and rotate a paddle wheel which have 0.5kg of water. The initial temperature of water is 1.5°C. Calculate the increase in the temperature. $(J = 4.2 \times 10^7 erg.cal^{-1}$; $g = 980$ cm s^{-2})   5

4. (a) Discuss the effect of pressure, temperature and humidity of the gas on the speed.   5

    (b) Explain, What is meant by a wave motion. What are its characterstics ?   4

    (c) At what tempreature is the speed of sound in nitrogen equal to its speed in oxygen at 20°C ? The atomic weights of oxygen and nitrogen are in the ratio 16 : 14.   5

5. (a) Derive the relation $\dfrac{1}{u} + \dfrac{1}{v} = \dfrac{1}{f}$ for a concave mirror. Where u is the object distance v is the image distance and f is focal length of the mirror.   5

    (b) Draw a diagram illustrating the path of rays in an astronomical telescope.   4

    (c) A ray of light is incident from glass on the surface separating it from air at an angle of 40° and is deviated through 15°. Calculate the critical angle for the glass air surface.   5

6. (a) Derive an expression for the drift velocity of electrons in conductor.   5

    (b) Describe the working of meter bridge.   4

    (c) Calculate the electric force between two charged spheres having charges $4 \times 10^{-7}C$ and $6 \times 10^{-7}C$ and placed 60cm apart in air. $(\varepsilon_0 = 8.854 \times 10^{-12}$ C^2 N^{-1} m^{-2})   5

7. (a) State Biot-Savart's Law. 5
   (b) Distinguish among diamagnetic, paramagnetic and ferromagnetic substances. 5
   (c) 5A current is flowing in a circular loop of diameter 0.5m. Calculate the magnetic field due to this coil at a distance of 0.15m along the axis of the loop from its centre. What will be the magnetic field if the point is taken at the centre of the coil ? 4

$$\left[\frac{\mu_0}{4\pi} = 10^{-7} \text{ TmA}^{-1} \right]$$

8. Write short notes on **any four** of the following :
   (a) Pascal's law $\quad$ **4x3½=14**
   (b) Modes of heat transfer
   (c) Stefan's law
   (d) Power of a lens
   (e) Electrical potential
   (f) Potentiometer

———