BET-012

DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN MECHANICAL ENGINEERING (DME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI / ACCLEVI / ACMEVI / ACELVI / ACECVI / ACCSVI

☐☐7☐3   **Term-End Examination**

December, 2018

BET-012 : PHYSICS

Time : 2 hours   *Maximum Marks : 70*

Note : *Question no. 1 is* **compulsory**. *Attempt any* **four** *questions from the remaining question nos. 2 to 7. Use of scientific calculator is permitted.*

1. Choose the correct answer from the four
    alternatives given below :   *14×1=14*

    (a) Bernoulli's equation is based on the
         conservation of

         (i)   momentum

         (ii)   energy

         (iii) mass

         (iv)   pressure

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(b) The unit of surface tension is

    (i) $N - m$

    (ii) $N - m^{-2}$

    (iii) Nm^{-1}

    (iv) $J\,kg\,m^{-3}$

(c) The dimensions of velocity gradient are

    (i) LT^{-1}

    (ii) T^{-1}

    (iii) L^2T^{-1}

    (iv) LT^{-2}

(d) If V_1 and V_2 are root mean square speeds of gas molecules at temperatures T_1 and T_2, respectively, then

    (i) $\dfrac{V_1}{V_2} = \sqrt{\dfrac{T_2}{T_1}}$

    (ii) $\dfrac{V_1}{V_2} = \dfrac{T_2}{T_1}$

    (iii) $\dfrac{V_1}{V_2} = \dfrac{T_1}{T_2}$

    (iv) $\dfrac{V_1}{V_2} = \sqrt{\dfrac{T_1}{T_2}}$

(e) Laplace formula for the speed is

(i) $v = \sqrt{\dfrac{\gamma P}{\rho}}$

(ii) $v = \sqrt{\dfrac{P}{\rho \gamma}}$

(iii) $v = \sqrt{\dfrac{P \rho}{\gamma}}$

(iv) $v = \sqrt{\dfrac{\rho \gamma}{P}}$

(f) Power of a lens is measured in

(i) metres

(ii) cm

(iii) kilometres

(iv) diopters

(g) Astronomical telescope consists of

(i) two convex lenses

(ii) two concave lenses

(iii) one convex lens and one concave lens

(iv) two plano-convex lenses

(h) Luminous flux is defined as
  (i) amount of electromagnetic energy 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 source
  (iv) amount of electromagnetic energy received per second by a surface

(i) Four resistances of same values are connected in parallel. The total resistance of the said combination will be
  (i) four times the resistances
  (ii) one-fourth of the resistance
  (iii) half of the resistance
  (iv) twice of the resistance

(j) The wire of potentiometer is made of
  (i) Copper
  (ii) Steel
  (iii) Manganin
  (iv) Aluminium

(k) In case of a moving coil galvanometer the deflection is
  (i) non-linearly proportional to the current
  (ii) directly proportional to the current
  (iii) directly proportional to the product of voltage and sine of the angle of deflection
  (iv) None of the above

(l)   Magnetic susceptibility χ is given by

   (i) $\chi = \dfrac{I}{H}$

   (ii) $\chi = \dfrac{H}{I}$

   (iii) $\chi = \dfrac{B}{H}$

   (iv) $\chi = \dfrac{H}{B}$

(m)   The relative permeabilities of para and ferromagnetic materials are

   (i)   greater than unity

   (ii)   lesser than unity

   (iii)   equal to unity

   (iv)   negative

(n)   Positive ions can be accelerated by

   (i)   cyclotron

   (ii)   betatron

   (iii)   thyratron

   (iv)   None of the above

2.   (a)   What are cohesive and adhesive forces ? Give two examples of each type of these forces.

   (b)   Define coefficient of viscosity.

   (c)   Define Poisson's ratio.   *6+4+4*

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

(b) Explain thermal conductivity.

(c) Velocity of sound in air is 330 ms^{-1}. Calculate the frequency of sound of wavelength 16·5 m.   *6+4+4*

4. (a) Prove the lens formula

$$\frac{1}{f} = (n - 1)\left(\frac{1}{R_1} - \frac{1}{R_2} \right).$$

(b) A ray of light is incident through glass on the interface separating it from air at an angle of 40° and is deviated through 15°. Calculate the critical angle for the glass-air surface.   *10+4*

5. (a) State Coulomb's law and explain the concept of electric field.

(b) Calculate the electric potential at a point P due to a charge of 2×10^{-8} C situated 8 cm away from it $\left(\dfrac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2} \right)$.

(c) Describe the working of the potentiometer. *6+4+4*

6. (a) Show how a galvanometer will be converted into (i) an ammeter, and (ii) a voltmeter.

(b) What is Biot-Savart's law ?

(c) The radius of a cyclotron's dees is 50 cm and the value of cyclotron frequency is 15 MHz. Calculate the magnetic field and kinetic energy of the proton beam produced by the cyclotron.   6+4+4

$(e = 1·6 \times 10^{-19}$ C, m $= 1·67 \times 10^{-27}$ kg.

7. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2} = 14$

(a) Venturimeter

(b) Hooke's Law

(c) Avogadro's Law

(d) Total Internal Reflection

(e) Meter Bridge

(f) Voltaic Cell