Sub.Code : 1021'B'

NEB - GRADE XII
2079 (2022)
Physics
Grade Increment (Supplementary) Examination

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Time: 3 hrs. **Full Marks: 75**

Attempt **all** the questions.

Group 'A' 11×1=11

Rewrite the correct options of each questions in your answer sheet.

1. In S.H.M., particle velocity is minimum at
   (A) extreme positions (B) mean position
   (C) half of the amplitude (D) one fourth of the amplitude
2. The SI unit of surface tension is
   (A) dyne/cm (B) *N/m* (C) N/m^2 (D) Nm
3. The spokes are used in bicycle wheel to
   (A) increase frictional force (B) to decrease frictional force
   (C) decrease moment of inertia (D) increase moment of inertia
4. The efficiency of carnot engine working between 27°C and 127°C is
   (A) 50% (B) 100% (C) 25% (D) 75%
5. During adiabatic compression of a gas, its temperature
   (A) falls (B) remains constant (C) rises (D) becomes zero
6. The distance between any two censecutive antinodes in a stationary wave is
   (A) λ (B) $\frac{\lambda}{2}$ (C) $\frac{\lambda}{4}$ (D) 2λ
7. Which of the following doesn't explain wave theory of light ?
   (A) polarization (B) interference
   (C) diffraction (D) photoelectric effect
8. In a series A.C circuit R = 100Ω, X_L = 300Ω, X_C = 200Ω, the phase difference between the applied emf and current will be..
   (A) 0° (B) 37° (C) 90° (D) 45°
9. To convert a galvanometer into ammeter
   (A) a high resistance should be connected in parallel to the galvanometer
   (B) a low resistance should be connected in parallel to the galvanometer

Contd...

   (C) a high resistance should be connected in series to the galvanometer
   (D) a low resistance should be connected in series to the galvanometer
10. Which one is used in the core of a transfermor ?
    (A) soft iron (B) steel (C) Aluminium (D) zinc
11. Avalanche breakdown occurs when
    (A) forward current becomes excessive
    (B) potential barrier is reduced to zero
    (C) forward bias exceeds a certain value
    (D) reverse bias exceeds a certain value

Group 'B' 8x5=40

12. a) Define S.H.M. and write its equation. 1+1
    b) Calculate the period of oscillation of a simple pendulum of length 1.8m with a bob of mass 2.2kg. If the bob of this pendulum is pulled aside a horizontal distance of 20cm and released, what will be the K.E. of the bob at the lowest point of swing. 3

    OR

    a) Define moment of inertia. 1
    b) Derive the relationship between angular momentum and moment of inertia. 2
    c) A constant torque of 500 Nm turns a wheel which has a moment of inertia 20 kgm^2 about its centre. Find the angular velocity gained in two seconds. 3
13. a) Define surface tension. 1
    b) Establish a relation between surface tension and surface energy of a liquid. 2
    c) Find the workdone required to break up a drop of water of radius 5×10^{-3}m into eight drops of water assuming isothermal condition. 2
14. a) State first law of thermodynamics 1
    b) Cp is always greater than Cv, explain why ? 2
    c) A carnot engine takes 4.2×10^6 J of heat from reservoir at 627°C and performs external work. The remaining energy is rejected into a sink at 27° C. What is the efficiency ? How much work does it perform ? 1+1
15. a) What are organ pipes ? 1
    b) Describe first and second modes of vibration of air column inside a closed organ pipe. 2

Contd...

c) An organ pipe open at both ends is 0.5m long. what is the fundumental frequency if velocity of sound is 350 m/s ? 2

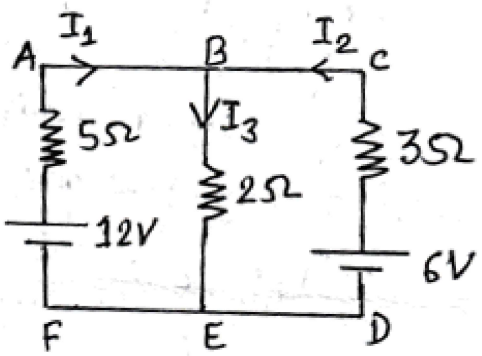
OR

a) Why does an empty vessel produce louder sound than the filled one ? 2

b) Deduce an expression of apparent frequency of sound wave when the source of sound is moving towards a stationary observer. 2

c) Define one bel. 1

16. a) Using Kirchhoff's laws in the electrical network shown in the adjacent figure.



i) Calculate the value of I_1 and I_2. 2

ii) p.d between pints A and F 1

b) Draw a labelled wheat stone bridge circuit. Write down the balance condition of it. 2

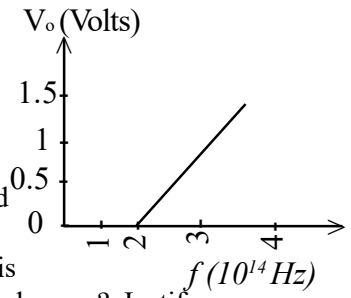
17. a) Write mathematical expression for Faraday's law of electromagnetic induction. 1

b) Derive an expression for the self inductance of a solenoid. 2

c) A wire of length 0.1m moves with speed of 10m/s perpendicular to a magnetic field of induction 1wb/m^2. Calculate the induced emf. 2

18. a) What are photons ? 1

b) The adjacent figure shows a plot of stopping voltage versus frequency of incident radiation for photoelectric effect in sodium.



i) Calculate the threshold frequency and work function of sodium. 2

ii) If intensity of the incident radiation is increased, does the slope of the line change ? Justify your answer. 2

19. a) Can we use water instead of clock oil in Millikan oil drop experiment ? Justify your answer. 2

Contd...

b) Taking electronic charge to be -1.6×10^{-19}C, calculate the potential differnce (in volts) necessary to be maintained between two horizontal conducting plates, one 5mm above the other so that a small oil drop of mass 1.31×10^{-14} kg with two electrons attached to it remains in equilibrium between them. 2

c) In question (b) which plate must be positive potential ? 1

Group 'C' 3x8=24

20. a) Define interference of light. Does it follow the principle of conservation of light energy ? Justify your answer. 2

b) In Young's double slits experiment, show that bright and dark fringes are equally spaced. 3

c) In Young's double slit experiment the slits are 0.03 cm appart and the screen is placed 1.5m away. The distance between the central bright fringe and fourth bright fringe is 1 cm. Calculate the wave length of light used. 3

21. a) Why does a current carrying conductor experience a force in a magnetic field ? 2

b) i) State Ampere's circutal law. 1

ii) Use it to obtain expression of magnetic field due to a long solenoid. 3

c) A slice of indium antimonide is 2.5 mm thick and carries a current of 150 mA. A magnetic field of flux density o.5T, correctly applied, produces a maximum Hall voltage of 8.75 mV between the edges of the slice. Calculate the number of free charge carriers per unit volume, assuming they each have a charge of 1.6×10^{-19}C. 2

OR

a) What do you mean by thermo-electronic effect ? 1

b) Discuss the variation of thermo-emf in a thermo-couple with the change in temperature. 2

c) What do you mean by wattless current ? 1

d) Derive an expression of impedence in L-C-R series circuit and write down the condition of resonance. 3+1

22. a) Write the postulates of Bohr's model of atom. 2

b) Obtain expression of total energy of electron in n^{th} orbit of H-atom. 2

Contd...

c) Electrons in an x-ray tube accelerate through a potential difference of 10KV before striking the target. If an electron produces one photon on impact with the target, what is the minimum wave length of the resulting x-rays ? [Given h = 6.62×10^{-34}Js and C = 3×10^{8}m/s] 2

d) Explain why electrons can not lie inside a nucleus. 2

OR

a) What is a semiconductor diode ? 1

b) Write symbol and truth table of NAND gate. 2

c) State radioactive decay law and obtain the relation between decay constant and half life. 1+2

d) Compute the activity of one gram of Th-232 whose decay constant is $1.58\times10^{-18}s^{-1}$ [Avogadro's number =6.02×10^{23}/mole] 2

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