2016

PHYSICS

(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three Hours and *Fifteen Minutes

*(*15 minutes are given as extra time for reading questions)*

*Attempt **all** questions.*

The figures in the right margin indicate full marks for the questions.

*Question Nos. **1** to **10** are 'Very Short Answer' type questions carrying **1** mark each.*

1. Define electric potential at a point. 1

2. What is meant by drift velocity of the free electron ? 1

3. A carbon resistor of $42M\Omega \pm 20\%$ is to be marked with rings of different colours for its identification. Write the sequence of colours. 1

4. What is the value of μ_o in SI unit ? 1

P.T.O.

5. Why alkali metals are most suitable for photoelectric emission ? 1

6. Why do α -particles have high ionizing power ? 1

7. What is meant by doping ? 1

8. What is the full form of LED ? 1

9. Draw the symbol for the NOR gate. 1

10. What is broadcast communication ? 1

Question Nos. 11 to 20 are 'Short Answer Type-II' questions carrying 2 marks each.

11. A uniformly charged conducting sphere of 0·7 m diameter has a surface charge density of 100 μCm^{-2} . Calculate the charge on the sphere and total electric flux passing through the sphere. 2

12. Show that the electric field is always directed perpendicular to an equipotential suraface. 2

13. The length of a conducting wire is 60 m and its radius is 0·5 cm. A potential difference of 5 V produces a current of 2·5 A in the wire. Calculate the resistivity of the material of the wire. 2

14. Give *two* points of difference between the magnetic properties of steel and soft iron. 2

15. No induced e.m.f. is produced in a conductor moving parallel to a magnetic field. Explain why ?   2

16. The Sun looks reddish at Sunrise and Sunset. Give reasons.   2

17. What are isotopes and isotones ?   2

18. Give *any two* points of difference between nuclear fission and nuclear fusion.

   2

19. What is space wave propagation ? Give two uses of it in communication system.   1+1=2

20. Write *two* important needs for Modulation.   2

Question Nos. 21 to 27 are 'Short Answer Type-I' questions carrying 3 marks each.

21. Deduce an expression for electrical potential energy of a system of two point charges.   3

22. Give *any two* points of difference between EMF of a cell and potential difference between two points of an electric circuit.   3

23. Write *three* properties of electromagnetic waves.   3

24. Give *three* advantages of reflecting type telescope over refracting type telescope. 3

25. Draw the ray diagrams to show a right-angled prism to turn the rays through

    (i)   90°

    and

    (ii) 180° $1\frac{1}{2}+1\frac{1}{2}=3$

26. State the laws of photoelectric emission. 3

27. Explain the working of a transistor as a switch. 3

Question Nos. 28 to 30 are 'Long Answer Type' questions carrying 5 marks each.

28. Derive an expression for the torque experienced on a current carrying rectangular loop kept in a uniform magnetic field. Under what condition is this torque maximum ?   4+1=5
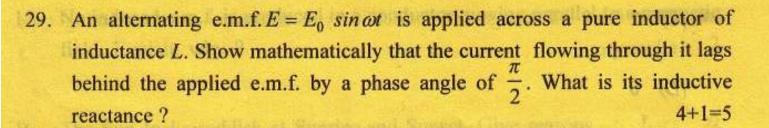
OR

Derive an expression for the torque experienced on a magnetic dipole placed in a uniform magnetic field. Under what condition is this torque maximum ?

   4+1=5

29. An alternating e.m.f. $E = E_0 \sin \omega t$ is applied across a pure inductor of inductance L. Show mathematically that the current flowing through it lags behind the applied e.m.f. by a phase angle of $\dfrac{\pi}{2}$. What is its inductive reactance ? 4+1=5

OR

An alternating e.m.f. $E = E_0 \sin \omega t$ is applied across a pure capacitor of capacitance C. Show mathematically that the current flowing through it leads behind the applied e.m.f. by a phase angle of $\dfrac{\pi}{2}$. What is its capacitive reactance ? 4+1=5

30. Derive the lens maker's formula in case of a double convex lens. 5

OR

Derive an expression for fringe width using Young's double slit method for interference of light. 5

*Question Nos. **31** to **34** are 'Multiple Choice Type' questions carrying **1** mark each. Choose the correct answer out of the four alternatives and rewrite the correct answer.*

31. The peak value of a.c. is 2 A, the effective value of a.c. is 1

   (A) 1

   (B) $\sqrt{2}$

(C) 2

(D) 0

32. If θ is the polarizing angle, then the refractive index of the materials is

1

(A) $\sin \theta$

(B) $\cos \theta$

(C) $\tan \theta$

(D) $\cot \theta$

33. Mass is converted into energy according to the relation

1

(A) $E = mc^2$

(B) $E = mgh$

(C) $E = \frac{1}{2}mc^2$

(D) $E = m/c^2$

34. For determining the light intensity we use 1

   (A) a photodiode in reverse bias

   (B) a photodiode in forward bias

   (C) LED in reverse bias

   (D) LED in forward bias

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