2017

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. State the principle of superposition of charges. 1

2. Why is manganin used for making standard resistors ? 1

3. State Ampere's circuital law. 1

4. Define induced current. 1

5. What is an electromagnetic spectrum ? 1

6. Eye is more sensitive to yellow colour but danger signals are made with red colour. Why ? 1

7. Write Einstein's photoelectric equation. 1

8. Give *one* example of isobars. 1

9. Define a semiconductor in terms of energy bands in solid. 1

10. Why is it necessary to use satellite for long distance TV transmission ? 1

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

11. State Gauss's law in the integral form and write its equation. 2

12. Two wires P and Q of same diameter and same length are joined in parallel and the combination is connected across a battery. The resistance of P i.e. R_p is greater than resistance of Q i.e. R_Q. Which wire will become hotter ?

2

13. What are primary functions of the electric field and magnetic field in a cyclotron ? 2

14. Why does not the energy of a charged particle moving in a uniform magnetic field change ? 　2

15. Differentiate between a.c. and d.c. by giving *two* points. 　2

16. Draw a common resonance curve for two resistances R_1 and R_2 $(R_1 > R_2)$ in L-C-R series circuit at resonant frequency f_r for the same values of L and C. 　2

17. The frequency of an electromagnetic wave is $1.5 \times 10^{18} Hz$. Calculate wavelength in angstrom. 　2

18. Draw a neat labelled ray diagram of a compound microscope in which the image of an object is formed at infinity. 　2

19. Distinguish between a photon and an electron by giving *two* points. 　2

20. Why is a nucleus more stable if it has large value of mass defect ? Explain. 　2

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

21. Show that the electric current in a wire is directly proportional to the drift velocity of electrons in that wire. 　3

22. How will you convert a galvanometer having 100Ω resistance which requires $1 mA$ current for its full scale deflection into an ammeter to read upto $1A$? 　3

23. Prove that the average power absorbed by an inductor in an a.c. circuit is zero.

3

24. Differentiate between interference and diffraction of light by giving *three* points.

3

25. A convex lens made of a glass of refractive index 3/2 has a focal length '*f*' in air. If it is immersed into water of refractive index 4/3, then with calculation, predict the new focal length of the lens inside water.

3

26. How do the mass number and atomic number change in α-decay ? A nucleus X becomes nucleus Y as a result of α-decay. Represent it by an equation.

3

27. Name *any three* communication channels.

3

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

28. What is a capacitor ? Derive an expression for capacitance of a parallel plate capacitor partly filled with a dielectric slab.

$1+4=5$

OR

In what form of field, is the energy of a capacitor stored ? Derive an expression for energy of a parallel plate capacitor.

$1+4=5$

29. Prove the laws of reflection using Huygens' principle.   5

OR

Prove the laws of refraction using Huygens' principle.   5

30. What is a rectifier ? Discuss the working of PN junction diodes as a full wave rectifier.   1+4=5

OR

What is an amplifier ? Discuss the working of a common emitter transistor (npn) as an amplifier.   1+4=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.
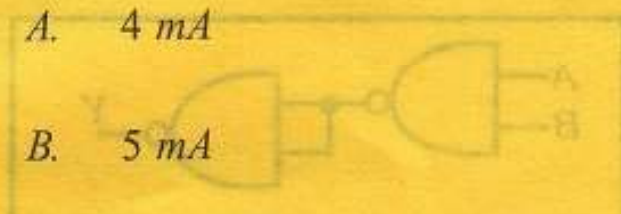
31. A charge of $10mC$ flows through a wire of cross section $2.5mm^2$ normally in 2 seconds. The current is   1

    A.   4 mA

    B.   5 mA

    C.   20 mA

    D.   25 mA.

32. The de Broglie wavelength λ is related to kinetic energy (E) of a particle as

1

A. $\lambda \propto \sqrt{E}$

B. $\lambda \propto \dfrac{1}{\sqrt{E}}$

C. $\lambda \propto E$

D. $\lambda \propto \dfrac{1}{E}$

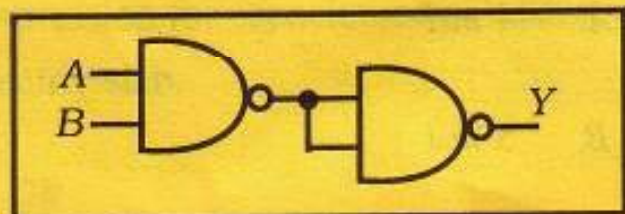33. The combination of NAND gates shown in the figure gives

1

A. AND gate

B. OR gate

C. NOT gate

D. None of the above.

34. The radio waves can be sent from one place to another through   1

    A.   Ground wave propagation.

    B.   Sky wave propagation.

    C.   Space wave propagation.

    D.   All the above.

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