A   **7029**

Register
Number

Part III — PHYSICS

(English Version)

Time Allowed : 3 Hours]   [Maximum Marks : 150

PART – I

N. B. : i) Answer *all* the questions.

  ii) Choose and write the correct answer.

  iii) Each question carries *one* mark. $30 \times 1 = 30$

1. Barkhausen condition for maintenance of oscillation is

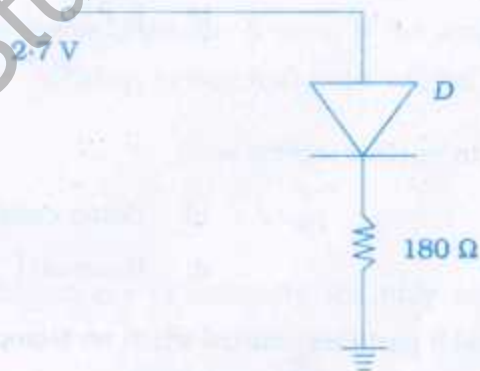 a) $\beta = \dfrac{1}{A}$ b) $A\beta = \infty$

  c) $A = \beta$ d) $A\beta = \dfrac{1}{\sqrt{2}}$.

2. Find the voltage across the resistor as shown in the figure (silicon diode is used).
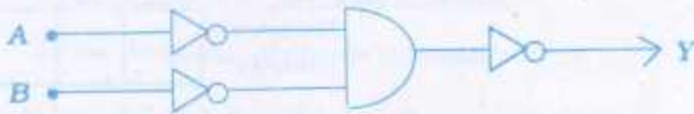

  a) 2·4 V   b) 2·0 V

  c) 1·8 V   d) 0·7 V.

[Turn over

3. The output (Y) of the logic circuit given below is

a) $A + B$

b) $A \cdot B$

c) $\overline{A + B}$

d) $\overline{A} + \overline{B}$.

4. Digital signals are converted into analog signals using

a) FAX

b) modem

c) cable

d) coaxial cable.

5. The RF channel in a radio transmitter produces

a) audio signals

b) high frequency carrier waves

c) both audio signal and high frequency carrier waves

d) low frequency carrier waves.

6. The work function of a metal is $6 \cdot 626 \times 10^{-19}$ J. The threshold frequency is

a) 1×10^{15} Hz

b) 10×10^{-19} Hz

c) 1×10^{-15} Hz

d) 10×10^{19} Hz.

7. Anaemia can be diagnosed by

a) $_{15}P^{31}$

b) $_{15}P^{32}$

c) $_{26}Fe^{59}$

d) $_{11}Na^{24}$.

8. The moderator used in nuclear reactor is

a) Cadmium

b) Boron carbide

c) Heavy water

d) Uranium $\left(_{92}U^{235} \right)$.

9. The numbers of α and β particles emitted when an isotope $_{92}U^{238}$ undergoes α and β decays to form $_{82}Pb^{206}$ are respectively

a) 6, 8

b) 4, 3

c) 8, 6

d) 3, 4.

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10. The nuclei $_{13}Al^{27}$ and $_{14}Si^{28}$ are examples of

a) isotopes   b) isobars

c) isotones   d) isomers.

11. If a and b are semi-major and semi-minor axes of the ellipse respectively and l is the orbital quantum number, then the expression to find the possible elliptical orbits is

a) $\dfrac{b}{a} = \dfrac{l+1}{n}$ b) $\dfrac{b}{a} = \dfrac{l-1}{n}$

c) $\dfrac{a}{b} = \dfrac{l+1}{n}$ d) $\dfrac{a}{b} = \dfrac{l-1}{n}$.

12. X-ray is

a) phenomenon of conversion of kinetic energy into radiation

b) conversion of momentum

c) conversion of mass into energy

d) conversion of light energy into heat energy.

13. According to Bohr's postulates, which of the following quantities take discrete values ?

a) Kinetic energy   b) Potential energy

c) Angular momentum   d) Momentum.

14. A crystal diffracts monochromatic X-rays. If the angle of diffraction for the second order is 90°, then that for the first order will be

a) 60°   b) 45°

c) 30°   d) 15°.

15. According to special theory of relativity the only constant in all frames of reference is

a) mass   b) length

c) time   d) velocity of light.

[Turn over

16. In LCR circuit when $X_L = X_C$, the current

    a)   is zero   b)   is in phase with the voltage

    c)   leads the voltage   d)   lags behind the voltage.

17. The radiations used in physiotherapy are

    a)   ultraviolet   b)   infrared

    c)   radiowaves   d)   microwaves.

18. In Newton's rings experiment, light of wavelength 5890 Å is used. The order of the dark ring produced where the thickness of the air film is 0·589 μm is

    a)   2   b)   3

    c)   4   d)   5.

19. Atomic spectrum should be

    a)   pure line spectrum   b)   emission band spectrum

    c)   absorption line spectrum   d)   absorption band spectrum.

20. Of the following, optically active material is

    a)   sodium chloride   b)   calcium chloride

    c)   sodium   d)   chlorine.

21. Peltier effect is the converse of

    a)   Joule effect   b)   Raman effect

    c)   Thomson effect   d)   Seebeck effect.

22. The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is

    a)   maximum   b)   zero

    c)   finite minimum   d)   infinity.

23. Transformer works on

    a)   both AC and DC   b)   AC more effectively than DC

    c)   AC only   d)   DC only.

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24. Lenz's law is in accordance with the law of

a) conservation of energy

b) conservation of charge

c) conservation of momentum

d) conservation of angular momentum.

25. The self-inductance of a straight conductor is

a) zero

b) infinity

c) very large

d) very small.

26. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences

a) only a net force

b) only a torque

c) neither a net force nor a torque

d) both a net force and a torque.

27. The unit of electric dipole moment is

a) volt / metre $\left(\dfrac{V}{m}\right)$

b) Coulomb / metre $\left(\dfrac{C}{m}\right)$

c) volt. metre (Vm)

d) Coulomb. metre (Cm).

28. Electric potential energy of an electric dipole in an electric field is given as

a) $pE \sin \theta$

b) $- pE \sin \theta$

c) $- pE \cos \theta$

d) $pE \cos \theta$.

29. Electric field intensity is 400 V/m at a distance of 2 m from a point charge. It will be 100 V/m at a distance of

a) 50 cm

b) 4 cm

c) 4 m

d) 1·5 m.

30. The brown ring at one end of a carbon resistor indicates a tolerance of

a) 1%

b) 2%

c) 5%

d) 10%.

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PART – II

31. Define electric potential at a point.

32. What is a polar molecule ? Give any two examples.

33. State Kirchhoff's voltage law.

34. Define drift velocity.

35. The resistance of a platinum wire at $0°C$ is $4 \, \Omega$. What will be the resistance of the wire at $100°C$ if the temperature coefficient of resistance of platinum is $0.0038/°C$?

36. In a galvanometer, increasing the current sensitivity does not necessarily increase the voltage sensitivity. Explain.

37. State Fleming's right hand rule.

38. A coil of area of cross-section $0.5 \, m^2$ with 10 turns is in a plane perpendicular to a uniform magnetic field of $0.2 \, Wb/m^2$. Calculate the flux through the coil.

39. What is Tyndall scattering ?

40. In Newton's rings experiment the diameter of certain order of dark ring is measured to be double that of second ring. What is the order of the ring ?

41. State Moseley's law.

42. Define ionisation potential.

43. Mention the uses of electron microscope.

44. What is meant by pair production and annihilation ?

45. The half-life of radon is 3.8 days. Calculate its mean life.

46. What is rectification ?

47. What is a light emitting diode ? Give any one of its uses.

48. Define bandwidth of an amplifier.

49. When there is no feedback the gain of the amplifier is 100. If 5% of the output voltage is fed back into the input through a negative feedback network, find out the voltage gain after feedback.

50. What are the advantages of digital communication ?

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PART – III

N.B. :　i)　Answer Question No. **60** compulsorily.

　　　　ii)　Answer any *six* of the remaining 11 questions.

　　　　iii)　Draw diagrams wherever necessary.　　　　$7 \times 5 = 35$

51.　Write the properties of lines of forces.

52.　How will you compare the *e.m.f.s* of two cells using a potentiometer ?

53.　A moving coil galvanometer of resistance $20\ \Omega$ produces full scale deflection for a current of 50 mA. How will you convert the galvanometer into (i) an ammeter of range 20 A and (ii) a voltmeter of range 120 volt ?

54.　Give the applications of eddy currents.

55.　Write a note on Nicol prism.

56.　Wavelength of Balmer Second line is 4861 Å. Calculate the wavelength of the first line.

57.　Derive an expression for de Broglie wavelength of matter waves.

58.　Define work function. State the laws of photo-electric emission.

59.　Explain how a cosmic ray shower is formed.

60.　In the given network, calculate the effective resistance between points *A* & *B*.

OR

The effective resistances are $10\ \Omega$, $2\cdot4\ \Omega$ when they are connected in series and parallel respectively. What are the resistances of individual resistors ?

61.　With the circuit diagram, explain voltage divider biasing of a transistor.

62.　Mention the principle of RADAR and write its applications.

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PART – IV

N. B. :
   i)   Answer any *four* questions in detail.

   ii)   Draw diagrams wherever necessary.   4 × 10 = 40

63. Derive an expression for electric field due to an electric dipole at a point along the equatorial line.

64. Explain in detail the principle, construction, working and limitations of a cyclotron with a diagram.

65. Describe the principle, construction and working of a single phase a.c. generator.

66. Explain Raman scattering of light with the help of energy level diagram.

67. How will you determine the wavelength of X-rays using Bragg spectrometer ? Write any five properties of X-rays.

68. Explain the construction and working of a GM (Geiger-Müller) counter.

69. With circuit diagram explain the working of an operational amplifier as a summing amplifier.

70. With the help of a block diagram, explain the functions of various units in the monochrome television receiver.