HSC 12TH STANDARD

PHYSICS

MODEL QUESTION PAPER-III

TIME : 2.30 HOURS **MARKS : 70**

PART-I

I. CHOOSE THE CORRECT ANSWER. **15x1=15**

1. An electron and a proton are placed at a distance of r apart in free space. The ratio of the electrostatic force to the gravitational force between them is of the order of

   a) 10^{38} b) 10^{39} c) 10^{40} d) 10^{41}

2. The core of the transformer is laminated to minimize

   a) hysteresis loss b) eddy current

3. Kirchoff's laws can be applied for

   a) only D.C circuits b) only A.C circuits

   c) both D.C and A.C d) none

4. Which of the following represents Biot - Savart law?

   a) $dB = \frac{\mu_o}{4\pi} \frac{Id\ell}{r^2}$ b) $\overrightarrow{dB} = \frac{\mu_o}{4\pi} \frac{\overrightarrow{Id\ell} \times \hat{r}}{r^2}$

   c) $\overrightarrow{dB} = \frac{\mu_o}{4\pi} \frac{\overrightarrow{Id\ell} \times \overrightarrow{r}}{r^2}$ d) $dB = \frac{\mu_o}{4\pi} \frac{Idl \sin\theta}{r^3}$

5. A coil of wire of certain radius has 500 turns and a self inductance of 100 mH. The self inductance of another similar coil with 400 turns is

   a) 64 mH b) 80 mH c) 100 mH d) 76 mH

6. The ratio of velocities of visible light of wave length 4000 $\mathring{A}$ and infrared ray of wavelength 9000 $\mathring{A}$ in free space is

   a) 0.44 b) 2.25 c) 1 d) ∞

7. Intensity of the central maximum in Youngs double slit experiment is I. When one of the slit is closed the intensity is I_o. The ratio I / I_o is

a) 2 : 1 b) 1 : 2 c) 4 : 1 d) 1 : 4

8. Rydberg's constant for He is

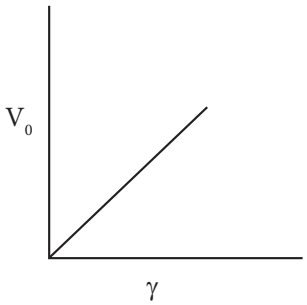
a) $1.094 \times 10^7 m^{-1}$ b) $2.188 \times 10^7 m^{-1}$ c) $4.376\ m^{-1}$ d) $6.625 \times 10^7 m^{-1}$

9. The longest wavelength that can be analysed by a rock salt crystal of lattice distance 2.82 A in the second order is

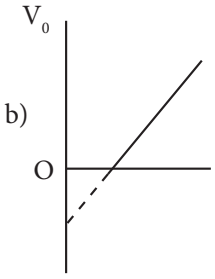
a) $5.64 \times 10^{-10} m$ b) $1.128 \times 10^9 m$ c) $2.82 \times 10^{-10} m$ d) $5.46 \times 10^{-10} m$

10. Which of the following graph shows the variation of cut off voltage V_o with frequency of incident light

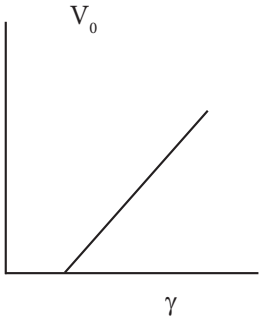
a)



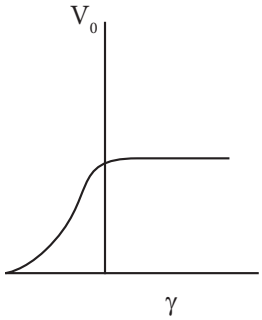
b)



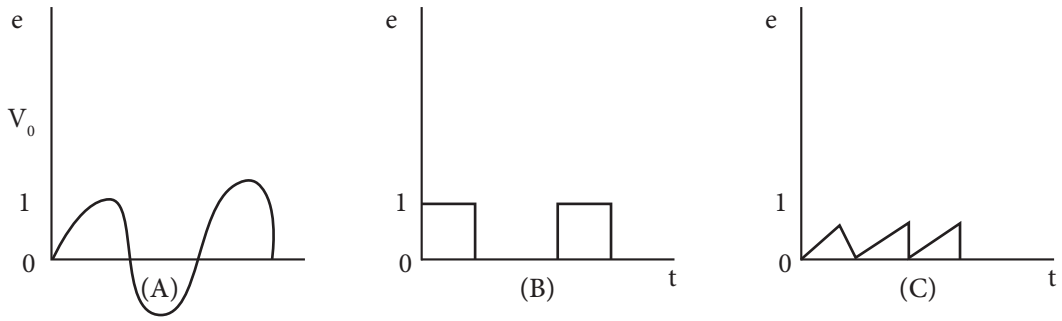
c)



d)



11. The variation of signals with time is shown



a) all are anologue signals

b) A, B are digital C is analogue

c) A and C are digital but B is analogue

d) A and C are analogue but B is digital

12. For a certain radio active substance it is observed that after 4 hours, only 6.25 % of the original sample is left undecayed. It follows that,

    a) the half life of the sample is 1 hour

    b) the mean life of the sample is $\frac{\log 2}{3600}$ hours

    c) mean life of the sample is 1 hour

    d) all the above are correct

13. Out of the following, which is not emitted by a radio active substance is

    a) Electrons

    b) Electromagnetic radiations

    c) Neutrons

    d) Helium nucleii with a charge equal to that of two protons.

14. The electromagnetic energy is converted into an electrical signal at

    a) receiver b) transmitter

    c) Antenna d) both receiver and transmitter

15. In amplitude modulation, if signal amplitude and carrier amplitude are equal, then the amplitude of lower side band is

    a) E_C b) $W_C - (W_s)_{max}$ c) $\frac{E_C}{2}$ d) $W_C + (W_s)_{max}$

PART - II

Answer any six questions in which Q.no: 18 is compulsory. 6x2=12

16) State Gauss law. Give the unit of electric flux.

17) A coil of area 10 cm^2 is placed in a uniform magnetic field of 0.3 Wb / m^2 with its plane perpendicular to the field. The coil rotates at a uniform rate to complete one revolution is 8 s. Find the average emf in the coil during intervals when the coil rotate from 0^0 to 90^0.

18. A stream of electrons each of mass m charge e and velocity 3 x 10^7 ms^{-1} is deflected 4 mm is passing for 15 cm through an electricfield of 1800 Vm^{-1} perpendicular to their path calculate e/m for electrons.

19. Give any four applications of photo electric cell

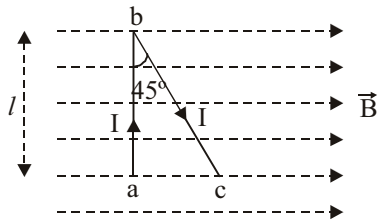
20. Give any two inferences obtained from BE/A curve.

21. When a nucleus (x) undergoes β decay and transforms to the nucleus (y) does the pair (x,y) form isotopes, isobars or isotones? Justify your answer.

22. A carrier wave of peak voltage 18 V is used to transmit a message signal Calculate the peak voltage of the modulating signal in order to have a modulation index of 50%.

23. Define output impedance of a transistor.

24. A wire abc is carrying current. It is bent as shown and is placed in a uniform magnetic field of magnetic indution B. Length ab = l and an angle $\angle abc = 45^0$ calculate the ratio of force on ab and on bc?



PART-III

Answer all the Questions in which Q. No: 31 is compulsory. **6 x 3 = 18**

25. A parallel plate capacitor is maintained at some potential difference. A 1mm thick slab is introduced between the plates. To maintain the plates at the same potential difference, the distance between the plates is increased by 2.4 mm. Find the dielectric constant of the slab.

26. What are the application of super conductors?

27. Explain positive and negative Thomson effect.

28. Obtain an expression for the current flowing in a circuit containing a pure inductance.

29. State and explain Brewster's law.

30. A soap film of refractive index 4/3 and of thickness 1.5×10^{-3}mm is illuminated by white light incident at an angle of 60^0. The reflected light is examined by a spectroscope in which dark band corresponds to a wavelength of 5000 Å. Calculate the order of the dark band.

31. Why the base region of a transistor made thin and lightly doped? Draw circuit diagram of input and output characteristics of N-p-N transistor in a common emitter configuration.

32. Explain the working of half wave diode rectifier.

33. What is meta stable state? Draw the energy level diagram for He-Ne laser.

PART-IV

Answer all the Questions **5 x 5= 25**

34. a) Describe the principle, construction and working of Vandegraff generator.

or

Give the Barkhausen criteria for oscillations. What are the essential component of LC oscillator. Explain the working of colpitt's oscillator (no need of circuit diagram).

35. Describe the construction and working of Bain bridge mass spectrometer.

or

Discuss the theory of plane transmission grating.

36. Obtain an expression for the magnetic induction at a point along the axis of a circular coil carrying current.

or

State the postulates of special theory of relativity and derive Einstein's mass energy equivalence.

37. Derive an expression for RMS value of a.c..

or

State and verify Faraday's laws of electrolysis.

38. Discuss the analysis of Amplitude modulation.

or

Describe the J.J. Thomson method for determining specific charge of electron.