Physics

Reg.No. :
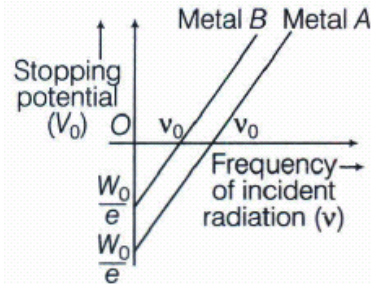
"All The Best"

Time : 01:30:00 Hrs

Total Marks : 45

Sec - A

1) Arrange the following electromagnetic waves in the order of their increasing wavelength: (a) γ rays (b) Microwaves   **1**
   (c) x-rays (d) Radiowaves

2) what is a wavefront?   **1**

3) The graph shows the variation of stopping potential with the frequency of incident radiation for two photosensitive   **1**


metals A and B.   Which one of the two has higher value of work function? Justify

your answer.

4) What is meant by critical size?   **1**

5) How does the effective power radiated by an antenna vary with wavelength?   **1**

Sec - B

6) Give one use of each of the following (i) Infrared rays (ii) Gamma rays (iii) microwaves (iv) ultraviolet rays   **2**

7) Why can we not get diffraction pattern from a wide slit illuminated by monochromatic light?   **2**

8) Write three basic properties of photons which are used to obtain Einstein's photoelectric equation. Use this equation   **2**
   to draw a plot of maximum kinetic energy of the electrons emitted versus the frequency of incident radiation

9) A piece of wood from the ruins of an ancient building was found to have a ^{14}C activity of 12 disintegrations per   **2**
   minute per gram of its carbon content. The ^{14}C activity of the living wood is 16 disintegrations per minute per gram.
   How long ago did the tree, from which the wooden sample came, die? Given half-life of ^{14}C is 5760 years.

10) In the given block diagram of a receiver identify the boxes labelled as X and Y and write their functions.   **2**
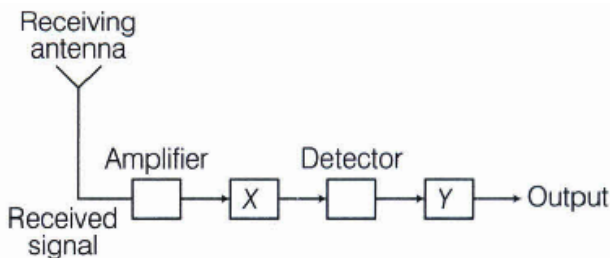
Sec - C

11) (a) giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eye-piece of focal   **3**
    length 15 m. If an eye-piece of focal length 1.0 cm is used, what is the angular magnification of the telescope ? (b) If
    this telescope is used to view the moon, what is the diameter of the image od the moon formed by the objective
    lens? The diameter of the moon id 3.48×10^6 m, and the radius of lunar is 3.8×10^8 m.

12) (a) Describe briefly how Davisson - Germer experiment demonstrated the wave nature of electrons. (b) An electron is   **3**
    accelerated from rest through a potential V. Obtain the expression for the de- Broglie wavelength associated with it.

13) Calculate the half-life period of radioactive substances if its activity drops to $\frac{1}{16}$ th of its initial value in 30 years.   **3**

14) (i) State Bohr's quantisation condition for defining stationary orbits. How does de-Broglie's hypothesis explain the stationary orbits? (ii) Find the relation between the three wavelengths λ_1, λ_2 and λ_3 from the energy level diagram shown below. **3**
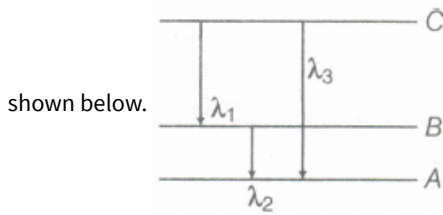
15) Output characteristics of an n-p-n transistor in CE configuration is shown in the figure. **3**
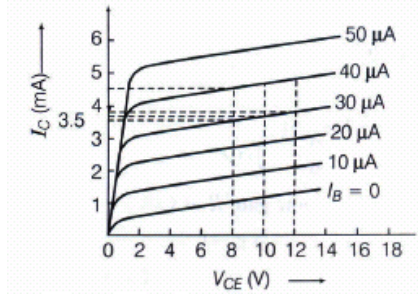
Determine, (i) dynamic output resistance (ii) DC current gain (iii) AC current gain at an operating point V_{CE}=10 V, when I_B=30μA.

Sec - D

16) How is the working of telescope different from that of a microscope? The focal lengths of the objective and eyepiece o a microscope are 1.25cm and 5 cm, respectively. Find the position of the object relative to the objective in order to obtain an angular magnification of 30 in normal adjustment. **5**

17) (i) Differentiate between three segments of a transistor on the basis of their size and level of doping (ii) How is a transistor biased to be in active state? (iii) With the help of necessary circuit diagram, describe briefly how n-p-n transistor in CE configuration amplifies a small sinusoidal input voltage. Write the expression for the AC current gain. **5**

18) A neutron is absorbed by a $_3Li^6$ nucleus with subsequent emission of an alpha particle. Write the corresponding nuclear reaction. Calculate the energy released in this reaction. **3**
$m(_3Li^6) = 6.015126 \quad u, \quad m(_2He^4) = 4.0026044u$
$m(_0n^1) = 1.0086654 \quad u, m(_1H^3) = 3.016049 \quad u$
$Take \quad 1u = 931 \quad MeV$

19) A transmitting antenna at the top of a tower has a height 32 m and that of the receiving antenna is 50 m. What is the maximum distance between them for satisfactory communication in line of sidht mode? Given radius of earth is 6.4 x 10^6 m. **2**

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