2E1023

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B. Tech. II Semester (Main/Back) Examination, June/July-2011

Common to all Branches of Engineering

Physics- II

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt overall **five questions**, selecting **one** question from **each unit.** All questions carry **equal marks.** (Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

Unit - I

1. A) i) Write down schrodinger's equation for a particle of mass 'm' trapped in a 3-Dimensional Box of side 'a'. Solve it for energy eigen values and eigen functions.

   ii) Find the lowest energy of a Neutron confined to a nucleus of size 10^{-14} meter.

   iii) Write a short note on Quantum Mechanical Tunneling. **(8+4+4=16)**

OR

B) i) Define the fermi energy. Write down the expression for the Fermi-Dirac distribution law. also derive an expression for the Fermi Energy for the system of particles.

   ii) Calculate the Fermi Energy and Fermi velocity for free electron gas in Silver. Given the number of free electrons per unit volume in silver is 5.8×10^{28} per meter cube.

   iii) Write a short note on sommer fields free electron gas model. **(8+4+4=16)**

Unit - II

2. A) i) Explain the essential requirements for producing laser action. With neat and clean Diagram, Explain the working of He-Ne laser. How is population inversion achieved in this type of laser.

ii) Write short notes on the following :

    a)   Q - Switching.

    b)   Mode- locking.   **(8+8=16)**

OR

B) i)   Give two fundamental differences between a hologram and a photograph. Describe the method of recording the Hologram and reconstruction of image from it.

   ii)   Write short notes on the following :

    a)   Holographic Microscopy.

    b)   Semiconductor laser.   **(8+8=16)**

Unit - III

3. A) i)   What do you mean by Numerical Aperture of an Optical fibre. Find the Expression for the Numerical aperture of a step index fibre.

   ii)   Compare the maximum angle of acceptance and Numerical aperture of two fibres. Characterized by core and cladding index n_1 & n_2 respectively

    a) $n_1 = 1.6, n_2 = 1.5$

    b) $n_1 = 2.1, n_2 = 1.5$ **(10+6=16)**

OR

B) i)   What do you mean by spatial and Temporal coherence, for propagating waves?

    Show that visibility is a measure of degree of coherence.

   ii)   Explain the use of optical fibres in

    a)   Fibroscope

    b)   Sensor

    c)   Optical gyroscope   **(10+6=16)**

Unit - IV

4. A) i)   Explain the construction and working of a G.M. counter, give its important applications. How quenching is achieved in this counter.

   ii)   What are the advantages of proportional counter over G.M. counter   **(12+4=16)**

B) i) What is dielectric, dielectric constant and dielectric polarization. How shall you experimentally measure dielectric constant by schering method.

ii) The capacity of a capacitor is increases by 120% when filled completely by dielectric find its dielectric constant (12+4=16)

Unit - V

5. A) i) State Ampere's law in Integral and differential form. Why it is modified by Maxwells.

ii) Derive Maxwells equation for a linear-isotropic conducting medium

(8+8=16)

OR

B) i) What do you mean by divergence of a vector field? Explain its physical significance.

ii) Deduce Maxwell's equations for free space and prove that the electromagnetic waves are Transverse.

iii) If $\vec{A} = x^2 z\hat{i} - 2 y^3 z^2 \hat{j} + x y^2 z\hat{k}$, find the values of

a) div $\vec{A}$

b) Curl $\vec{A}$

at a point (2, 2, 2) (4+8+4=16)

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