

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), April 2016

B. Tech./B. Tech+M. Tech (Branch: Common to All Branches), Semester II

Roll No.....

PH201: Engineering Physics-II

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Mobiles are not allowed during examination.
5. Non-programmable calculator is allowed.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. Gauss's law is one of the fundamental equations of electromagnetic theory
(a) false (b) true
(c) uncertain (d) none of these
- ii. Magnetic flux density emerging out of closed surface is
(a) infinite (b) zero
(c) very small (d) very large
- iii. In GM Counter, quenching means _____
(a) preventing fresh avalanches (b) producing fresh avalanches
(c) measuring particle energies (d) none of above
- iv. Metal possess
(a) high electrical and thermal conductivity (b) obey Ohm's law
(c) at high temperature, resistivity is proportional to temperature (d) all
- v. Velocity of light is independent of motion of observer. [YES/NO]
- vi. The average life time of the metastable state is _____
(a) 10^{-15} (b) 10^{-10} (c) 10^{-8} (d) 10^{-3}
- vii. A laser requires mirrors because
(a) they provide optical feedback (b) they invert the population inversion
(c) they determine the wavelength at which lasing occurs (d) none
- viii. Is $n_x = n_y = n_z = 1$ state degenerate?
- ix. To be a solution of the Schrodinger equation, the wave function should be
(a) single valued, continuous (b) multivalued and continuous
(c) single valued and discontinue (d) multivalued and discontinuous



- x. Maxwell-Boltzmann statistics is applicable to
- (a) identical distinguishable particles (b) identical indistinguishable particles
- (c) fermions (d) bosons

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- i. Discuss the temperature dependence of conductivity of semiconductors and conductors.
- ii. Classify conductors, insulators and semiconductors on the basis of band theory of solids.
- iii. What does pumping mean for laser action?
- iv. What are the proper frame and proper time?

Q.3A Explain the principle of particles i.e. α , β detection by GM counter. 05

Q.3B Calculate the pulse amplitude generated in the ionization chamber when 1 MeV charged particle loses all its energy. The circuit capacitance is 10^{-10} F. Assume that the energy required per ion pair is 35 eV. 05

Q.4A Distinguish the step index and graded index optical fibre on the basis of operation and applications? What are the advantages of communication through optical fibre rather than other conventional medium? 05

Q.4B A step index optical fibre with $n_1=1.50$ and $n_2=1.40$ is used in water, $n_w=1.33$. Find maximum angle of acceptance and velocity of the wave through the fibre. 05

Q.5A Determine the Eigen functions and Eigen values a moving particle in a three dimensional box using Schrodinger's wave equation. 05

Q.5B A spacecraft is measured to be 120 m long and 20 m in diameter. If this spacecraft flies with a speed of $0.99c$, what length and diameter does the observer on the earth measure? 05

Q.6A State and prove the pointing theorem and use it to drive power flowing through a coaxial cable. 05

Q.6B Show that $\nabla \cdot \mathbf{r} = 3$ and $\nabla \times \mathbf{r} = 0$ where $\mathbf{r}$ is vector physical quantity. 05

OR

Q.6B Define curl grad $\phi = 0$ 05

- Q.7A Determine the degeneracy of energy level having energy $\frac{15\pi^3\hbar^2}{ma^2}$ trapped in a three-dimensional potential well of side a. 05
- Q.7B Derive Maxwell's equations in differential form and outline their physical meaning. 05
- OR
- Q.7B What is Sommerfield's free electron gas model of metals? Derive an expression for the density of energy states. 05
- Q.8 What are essential requirements to produce a laser? Describe the characteristics, working and applications of He-Ne laser? 10
- Q.9A What are the postulates of special theory of relativity? Explain how the Lorentz transformation accounts for the phenomenon of time dilation. How time dilation can be verified experimentally? 10
- Q.9B What is tunnel effect? Prove that transmission probability for rectangular potential barrier $T > 0$ even if particle energy E is less than the barrier height V_0 . 10
- OR
- Q.9B Describe with a neat diagram the construction and working of the Scintillation counter. Explain how output voltage pulse depends on energy of the ionizing particle. 10

