

Sample Paper

Class Test-1

Branch- Electrical Engineering

Subject- **Engineering Physics (Circuit)**

Subject Code-3000A03AT015

Time – One hour thirty minutes

Maximum Marks: 20

Note: - All questions are compulsory.

CO	CO Statement
CO1	Analyse the concept of band theory and visualize semiconductor using band theory.
CO2	Identify the role of p-n junction diode in science and engineering applications.

Unit	Q. No.	Questions	Marks Allotted	CO	KL
1	1	Classify solids based on their electrical conductivity.	1	1	1
1	2	Explain the variation of the Fermi level in an intrinsic semiconductor with temperature.	2	1	2
1	3	With the help of energy band diagrams, differentiate between n-type and p-type semiconductors.	3	1	3
1	4	For n -type semiconductor material with high doping and low temperature show that $n = (N_c N_D)^{1/2} \exp\left(\frac{E_D - E_C}{2K_B T}\right)$ OR Show that the intrinsic carrier concentration is given by $n_i = (N_c N_v)^{1/2} \exp\left(\frac{-E_g}{2K_B T}\right)$	4	1	3
2	5	What is meant by the depletion region in a p–n junction diode?	1	2	1
2	6	Draw and explain the energy band diagram of a p–n junction under forward bias.	2	2	2
2	7	Describe the working principle of a Light Emitting Diode (LED) and give one practical application. OR The Saturation current density of a p-n junction Ge diode is 200mA/m ² at 300K. Find the voltage applied for which forward current density is 10 ⁵ A/m ² .	3	2	3
2	8	Explain the V–I characteristics of a p–n junction diode under forward and reverse bias conditions. OR Derive the rectifier equation for p-n junction diode	4	2	4

“Best of Luck”

Sample Paper

Class Test-II

Branch- Electrical Engineering

Subject- Engineering Physics (Circuit) Subject Code-3000A03AT015

Time – One hour thirty minutes

Maximum Marks: 20

Note: - All questions are compulsory.

CO	CO Statement
CO3	Explain wave optics concept and apply it to solve related problems in science and engineering.
CO4	Analyze various aspects of Lasers and optical fibres and their applications in diverse fields.
CO5	Learn to apply the concepts of dielectric and electron ballistics.

Unit	Q. No.	Questions	Marks Allotted	CO	KL
3	1	Why is the central spot dark in reflected light in Newton's rings Experiment?	2	3	1
3	2	Derive the grating equation $(a + b)\sin\theta = n\lambda$ for principal maximum in a diffraction grating, where $(a+b)$ is the grating element. OR Explain how Fresnel's bi-prism can be used to determine the thickness of a thin transparent sheet.	3	3	2
3	3	Calculate the minimum number of lines required in a grating to resolve the sodium D-lines ($\lambda_1 = 5890 \text{ \AA}$ and $\lambda_2 = 5896 \text{ \AA}$) in the second order.	2	3	3
4	4	What is an optical resonator? Explain its role in laser action.	2	4	2
4	5	Explain the construction and working principle of CO ₂ laser. What are its advantages? OR Describe the construction and working of Nd:YAG laser with a neat diagram.	3	4	2
4	6	Explain with diagrams: (a) multi-mode step-index fiber (b) multi-mode graded-index fiber (c) Single-mode step-index fiber. OR Explain different types of losses (attenuation) in optical fibers: (a) Absorption losses (b) Scattering losses (c) Bending losses.	3	4	2
5	7	What is electronic polarizability? Derive the expression for electronic polarizability of a monoatomic gas. OR Describe the construction and working of Bainbridge mass spectrograph with a neat diagram.	3	5	2
5	8	The electric susceptibility of a dielectric material is 3.5. Calculate its dielectric constant and relative permittivity.	2	5	3

“Best of Luck”