

21502

Roll No. _____

Total No. of Pages: 3

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B. Tech. II - Sem. (Old Scheme) (Back) Exam., (Academic Session 2021- 2022)
2FY2 - 02 Engineering Physics

Time: 2½ Hours

Maximum Marks: 160
Min. Passing Marks:

Instructions to Candidates:

Part - A: Short answer questions (up to 25 words) 6×4 marks = 24 marks.
Candidates have to answer six questions out of ten.

Part - B: Analytical/Problem solving questions 4×13 marks = 52 marks.
Candidates have to answer four questions out of seven.

Part - C: Descriptive/Analytical/Problem Solving questions 3×28 marks = 84 marks.
Candidates have to answer three questions out of five.

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.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL

2. NIL

PART - A

~~Q.1~~ What are the methods to create the coherent light source?

~~Q.2~~ Describe metastable state.

~~Q.3~~ What are the conditions for circular fringes and localize fringes in Michelson interferometer?

~~Q.4~~ What happen if distance between lens and plate increase in Newton's Ring experiment.

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Q.5 Describe Rayleigh Criterion of Resolution.

Q.6 What is physical significance of wave function?

Q.7 Proof that $\text{curl } \vec{r} = 0$.

Q.8 What is Fermi-Dirac distribution Function?

Q.9 If intensity of electric field is

$$\vec{E} = ixz^3 - j2x^2yz + k2yz^4$$

Calculate its divergence at point (1, 2, 3).

Q.10 Write down the three differences between simple light and laser light.

PART - B

Q.1 Explain the construction and working of Michelson Interferometer with the help of a suitable diagram.

Q.2 A particle is in one-dimensional box. Find its Eigen function and Eigen value.

Q.3 Calculate Refractive indices of the core and cladding material of a fiber from the given data

(NA = Numerical Aperture Δ = Fractional refractive index change)

$$NA = 0.22 \text{ and } \Delta = 0.012$$

Q.4 What is Faraday Law of Induction? Derive the Maxwell equation from it.

Q.5 A plane diffraction grating has 6000 lines per cm. Calculate the highest order of spectrum which can be seen with light of wavelength 4000 \AA .

Q.6 Explain clearly the propagation of an electromagnetic wave inside optical fiber. Use proper diagram for derive the expression of numerical aperture.

Q.7 Explain -

(i) Spontaneous emission

(ii) Stimulated emission

And find out relationship between Einstein co-efficient.

PART - C

Q.1 Explain Fraunhofer diffraction due to single slit with the help of suitable diagram and proof that intensity of secondary maxima are in the ratio.

$$1 : \frac{1}{22} : \frac{1}{61} : \frac{1}{121} \dots\dots\dots$$

Q.2 Explain the formation of Newton's Ring and prove that diameter of dark ring is proportional to the square root of Natural number.

Q.3 Describe the construction and working of semiconductor LASER with the help of suitable diagram.

Q.4 Explain Maxwell's Four Equations in differential and integral form.

Q.5 (a) Explain Hall Effect with the help of suitable diagram and show that for n-type

semiconductor coefficient is given by $R_H = - \frac{1}{ne}$

(b) Conductivity and Hall coefficient of n-type Si are $112 \Omega^{-1} \text{m}^{-1}$ and $1.25 \times 10^{-13} \text{m}^3 \text{C}^{-1}$ respectively calculate charge carrier density and electron mobility.

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