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B. TECH.
(SEM I) THEORY EXAMINATION 2018-19
ENGINEERING PHYSICS

Time: 3 Hours *Total Marks: 100*

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x10 = 20**

a. How the negative results of Michelson-Morley experiment interpreted?
b. At very low velocities, how Lorentz equations reduce to the classical Galilean equations.
c. What are coherent sources?
d. Explain the formation of colors in thin films
e. What do you mean by diffraction of light?
f. Define plane of polarization and plane of vibration.
g. Define optic axis of doubly refracting crystal.
h. What do you mean by dispersive power of a grating?
i. Define metastable state.
j. Give few important applications of optical fibre.

SECTION B

2. Attempt any *three* of the following: **10 x 3 = 30**

a) What do you mean by length contraction at relativistic speed? Deduce the necessary expression for it. Show that the circle, $x^2+y^2=a^2$ in frame S appears to be an ellipse in frame S' which is moving with relative to S.

b. Describe and explain the formation of Newton's rings in reflected in monochromatic light. In Newton's experiment the diameter of 4^{th} and 12^{th} dark rings are 0.400 cm and 0.700 cm respectively, deduce the diameter of 20^{th} dark ring.

c. What is resolving power of a grating? A plane transmission grating has 1500 lines per inch. Find the resolving power of the grating and the smallest wavelength difference that can be resolved with a light of wavelength 6000Å in the second order.

d. Explain the phenomenon of double refraction in uniaxial crystals. Give the construction and theory of quarter wave plate. Find the thickness of quarter and half wave plate for the wave length of light 5890 Å and $\mu = 1.55, \mu = 1.54$

e. What do you mean by numerical aperture? Derive expression for them. The velocity of a light in the core of silica fibre is 2 x 10^8m/s and the critical angle at the core cladding interface is 60°. Determine:
i) The refractive index of the core and cladding.
ii) The numerical aperture for the fibre.

SECTION C

3. Attempt any *one* part of the following: **10 x 1 = 10**

a) Show that the relativistic invariance of the law of conservation of momentum leads to the concept of variation of mass with velocity.

b) Deduce Einstein's mass energy relation. If the kinetic energy of a body is twice its rest mass energy, find its velocity.

4. **Attempt any *one* part of the following:** **10 x 1 = 10**

a) Explain how wavelength of sodium light can be calculated from Fresnel biprisim experiment.

b) Discuss the phenomenon of diffraction at a single slit and show that intensities of successive maxima are 1: —: ——: ——

5. **Attempt any *one* part of the following:** **10 x 1 = 10**

a) Describe the construction, working and use of Nicol prism? Explain how it can be used as a polarizer and as an analyzer.

b) Discuss the construction and working of a He-Ne laser. Compare it with Ruby Laser.

6. **Attempt any *one* part of the following:** **10 x 1 = 10**

a) Describe an optical fibre. Explain basic principal f optical fibre. Discuss fibre classification.

b) Explain the principle of Holography and discuss its characteristics and applications?

7. **Attempt any *one* part of the following:** **10 x 1 = 10**

a) Deduce an expression for time dilation on the basis of Lorentz transformation equation .The mean life of a meson is 2x10-8 second. Calculate the mean life of a meson moving with a velocity 0.8c.

b) What are Einstein's coefficients? Obtain a relation between them. Also discuss the essential condition for laser action.

Physical Constants

Rest mass of electron	m_o	$= 9.1 \times 10^{-31}$ kg
Rest mass of Proton	m_p	$= 1.67 \times 10^{-27}$ kg
Speed of light	c	$= 3 \times 10^{8}$ m/s
Planck Constant	h	$= 6.63 \times 10^{-34}$ J-s
Charge on electron	e	$= 1.6 \times 10^{-19}$ C
Boltzmann Constant	k	$= 1.38 \times 10^{-23}$ J K^{-1}