Sub Code:NAS101

Paper Id: 199121 Roll No: | | | | | | | | | | | | |

B. TECH
(SEM-I) THEORY EXAMINATION 2019-20
ENGINEERING PHYSICS-I

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. What are mass less particles?

b. Is earth an inertial frame? Explain.

c. What do you mean by group velocity?

d. Show that probability at the center of the 1-D potential box is minimum for first excited state.

e. Give the statement of Heisenberg's uncertainty of principle.

f. What happen to diameter of Newton's ring, if a liquid of refractive index of μ is inserted between plano-convex lens and plane glass plate?

g. What do you mean by dispersive power of grating?

h. Define the phenomena of double refraction?

i. Give few important applications of laser.

j. What is hologram?

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 Constant velocity relative to S.

b. Derive an expression for the wave function and energy of a particle confined in one dimensional potential box of length L using Schroedinger's wave equation. Calculate the energy difference between the first excited state and third excited state for an electron in a one-dimensional rigid box of length 10^{-8} cm.

c. Explain the phenomenon of interference in thin film due to reflected rays. White light is incident on a soap film at an angle $\sin^{-1}4/3$ and reflected light is observed with spectroscope, it is found that two consecutive dark bands correspond to wave length 6.1×10^{-5} and 6.0×10^{-5}cm, if refractive index of film is 4/3, calculate the thickness of film.

d. What is retardation plate? Draw a ray diagram for extraordinary and ordinary rays before and after passing through a quarter wave plate. Find the thickness of quarter and half wave plate for the wave length of light 5000 Å and $\mu_O = 1.553, \mu_E = 1.544$.

e. What are acceptance angle, acceptance cone and numerical aperture of a fibre. Derive expression for them. Define numerical aperture. A core diameter of multimode fibre is 70 μm and relative refractive index difference is of 1.5%, it operates at a wavelength 0.85 μm, if refractive index of core is 1.46 calculate (1) Refractive index of cladding. (2) Normalized frequency (3) Number of guided modes.

SECTION C

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

(a) What was the objective of conducting the Michelson-Morley experiment? Describe the experiment. How is the negative result of the experiment interpreted?

(b) Derive Einstein's mass energy relation and give its experimental evidence.

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

(a) Discuss in brief the dual nature of matter and waves. Deduce an expression for de-Broglie wavelength of helium atom having energy at temperature T K.

(b) What is the aim of Davission-Germer experiment? Describe the experiment with conclusion in detail.

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

(a) Derive the expression of the diameter for bright ring in Newton's ring experiment. How can this experiment be used to find out the wavelength of unknown light?

(b) What is grating? Describe the formation of diffraction pattern due to plane diffraction grating.

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

(a) Explain how quarter wave plate used to detect circularly polarized and elliptically polarized light.

(b) What are the conditions for production of laser beam in case of three level laser system? Explain the principle of laser by schematic diagram.

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

(a) Describe the construction and reconstruction of image on hologram? Also describe few applications of holography?

(b) What is optical fiber? Describe the different types of optical fiber in detail.

Physical Constants

Mass of electron	m_o	$= 9.1 \times 10^{-31}$ kg
Mass of Proton	m_p	$= 1.67 \times 10^{-27}$ kg
Speed of light	c	$= 3 \times 10^{8}$ m/s
Planck's Constant	h	$= 6.63 \times 10^{-34}$ J/s
Charge on electron	e	$= 1.6 \times 10^{-19}$ C
Boltzmann's Constantk		$=1.38 \times 10^{-23}$ m^2 kg s^{-2} K^{-1}