Register Number:
DATE: 31-10-2019

ST.JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
B.Sc. PHYSICS -V SEMESTER
SEMESTER EXAMINATION-OCTOBER 2019
PH 5115: ELECTRONICS AND RELATIVITY.

Time: 2 ½ hours **Max.Marks:70**

This question paper has **two** printed pages and **three** parts

PART-A

Answer any **Four** of the following: (4x10=40)

1.a) With the circuit diagram explain the action of transistor(CE)as an amplifier.
b) How are the junctions biased in different regions of operation of a transistor? (7+3)

2. a) Give the comparison between BJT and FET.
b) Describe the drain characteristics of n- channel FET with a circuit diagram. (4+6)

3.a) What is an oscillator? Distinguish between negative and positive feedback.
b) Derive an expression for voltage gain of a non-inverting amplifier with a neat circuit diagram. (4+6)

.

4. a) What is a logic gate? Explain the basic logic gates with symbol and truth table.
b) Explain a half adder with truth table and a logic circuit. (5+5)

5. Describe Michelson-Morley experiment and discuss the negative result. (10)

6. a) Define Proper length. Obtain an expression for Lorentz contraction of a moving rod.
b) Obtain Energy –Momentum relation for a relativistic particle. (6+4)

PART-B

Answer any **Four** of the following: (4x5=20)

7. For a common emitter circuit, find base current and collector current also $V_{CE.}$
Given: $\beta=100$,$V_{BE} = 0.7$, $V_{CC}=20$ V, $V_{BB}=10$ V, $R_B = 1M\Omega$ and $R_C = 5k\Omega$.

8. In a Colpitt's Oscillator C1=C2 = C and L = 100μH.Find the value of capacitor of the oscillatory circuit if the frequency of oscillationf=500KHz.

9. Draw the dc load line and determine the operating point of a silicon transistor with Voltage divider bias with R_1 = 10kΩ,R_2 =5 kΩ,R_C=1kΩ, R_E=2kΩand V_{CC} =15 V.

10. A particle of rest mass moves with a speed0.6c. Calculate its mass, momentum total energy and kinetic energy.

11. The length of the spaceship is measured to be exactly half its actual length. Calculate (i) Speed of the spaceship and (ii) the time dilation corresponding to one second on the spaceship.

12. The input to the differentiator circuit is a sinusoidal voltage of peak value 5 mV and a frequency 2 KHz. Find the output if R = 100 KΩ and C=1 μF.

PART-C

Answer any **Five** of the following: (5x2=10)

13. a) What is the basic condition for the proper functioning of a transistor as an amplifier?

b) Can the source and drain in JFET be interchanged? Explain.

c) The Wien bridge oscillator uses both positive and negative feedback. Justify.

d**)** What are the input and output impedance's of an ideal op-amp.

e) Can a body be accelerated to velocity of light? Comment.

f) Explain why the ideas of relativity seems to be strange in day to day life?