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DATE:

Registration number:

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27**

**B.Sc. PHYSICS -V SEMESTER**

**SEMESTER EXAMINATION-February 2022**

**PH 5118: Electronics and Relativity.**

**Time: 2 hours** M**ax.Marks:70**

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

**PART-A**

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

1.(a) With the help of a diagram explain the output characteristics of a transistor in

CE mode, hence explain the dc current gain.

(b) What is load line? Explain how the dc load line is drawn. (7+3)

2.(a) With the neat diagram, explain the construction and working of a n-channel FET

(b) Give the differences between BJT and JFET. (7+3)

3.(a) Derive an expression for the voltage gain of an inverting amplifier.

(b) With the neat circuit diagram explain the working of Wien’s bridge oscillator. (4+6)

4.(a) Explain the construction and working of AND, OR gates using diodes with the

truth table

(b) With the neat diagram explain half adder with truth table. (6+4)

5. State the basic postulates of the special theory of relativity and obtain Lorentz

transformation equations. (10)

1. (a) Prove velocity addition theorem and explain its significance.

(b) Derive Einstein’s energy-momentum relation. (5+5)

**PART-B**

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

7. Calculate andfor thetransistor ifІc is measured as 1mA and **IB**= 25 µA.

Also determine the new base current if Іc = 5mA

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8. Calculate the drain resistance, transconductance and amplification factor of a JFET

from the following data.

|  |  |  |  |
| --- | --- | --- | --- |
|  | 0V | 0V | 0.3 V |
| **VDS** | 8 V | 16 V | 16 V |
| **ID** | 12 mA | 12.55 mA | * 1. A |

9. The frequency of a Colpitt’s oscillator is 18MHz. Find the value of the inductor to be used

if C1 = 100pF and C2 = 10pF. Also calculate the voltage feedback fraction.

1. What is the length of a meter stick moving parallel to its length when its mass is 5/3 of its

rest mass?

1. What is the mass of an electron that has a kinetic energy of 4Mev?
2. For a given operational amplifier if **Vin** = 1 Vpp, Rin = 10kΩ and Rf =100k, Find Closed loop

Voltage gain, input impedance of the circuit and the maximum operating frequency.

Given the slew rate = 0.5

**PART-C**

1. Answer any **Five** of the following:   (5x2=10)
2. What is the role of resistor RE connected in the emitter of a transistor amplifier?
3. Why biasing is necessary in amplifier circuit?
4. What do you mean by CMRR?
5. Which gate is called universal gate? Why?
6. Explain why the ideas of relativity seems strange in day-to-day life.
7. Why is it difficult to observe change of mass resulting from ordinary changes in energy?

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