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

Time: 1 hour

Max.Marks:30

PART-A

Answer any **two** of the following:

[2x10=20]

1. a) With a neat circuit diagram draw and explain the input and output characteristics of a transistor in CE configuration.
b) Explain the term thermal runaway in a transistor. [8+2]
2. a) Explain the concept of virtual ground in operational amplifiers.
b) Describe how an inverting operational amplifier functions as an integrator. [3+7]
3. a) Derive Lorentz transformation equations.
b) State the postulates of special theory of relativity. [8+2]

PART-B

Solve any **two** of the following:

[2x4=8]

4. Draw the D.C load line and determine the operating point of a transistor in a base bias resistor method. Given: $R_B=2M\Omega$, $R_C=5K\Omega$, $V_{CC}=20V$, $V_{BE}=0.7V$ and $\beta=100$.
5. The input to the differentiator circuit is a sinusoidal voltage of peak value 5 mV and frequency 1 kHz. Find the output voltage if $R_f = 100\text{ k}\Omega$ and $C = 1\mu F$.
6. What is the length of a meter stick moving parallel to its length when it's mass is $5/3$ of its rest mass?

PART-C

7. Answer any **two** of the following:

[2x1=2]

- a) Why is the base of a transistor made thin and highly doped?
- b) What is meant by open loop gain of an op amp?
- c) Can we apply special theory relativity to accelerated systems? Explain.