P.G. 1st Semester-2017

PHYSICS

(Electronic & Instrumentation)

Paper : MPHYCCT-104

Full Marks : 50 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer **Q. No. 1** and any **three** from the rest.

1. Answer any **five** questions: 2×5=10

   a) Define frequency modulation index.

   b) Write down the condition for maximum phase deviation in phase modulation.

   c) Simplify the equation

   $$Y = \bar{A}B\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + AB\bar{C}$$

   d) Design a first order active high pass filter having cut-off frequency of 200 Hz and a high frequency gain of 5.

   e) Write the advantages of an active filter over a passive filter. What do you mean by the bandwidth of a band pass filter.

   f) Draw a circuit diagram of a OP-AMP based phase-shift oscillator.

   g) Draw the band diagram of Tunnel diode at small forward biased condition.

   h) What is direct and indirect band gap semiconductors?

2. a) Describe the working principle of a Wien-bridge oscillator with proper circuit diagram. Find an expression for the frequency of oscillator.

   b) Discuss the amplitude stability of the Wien-bridge oscillator. 6+4=10

3. a) Design a logarithmic amplifier with OP-AMP and describe it with proper circuit diagram.

   b) What will happen if the diode and the resistor are interchanged in logarithmic amplifier?

   c) What is D/A converter. 5+4+1=10

4. a) Write down the linear envelope detection process for AM wave. Derive the power relation in between the carrier wave and amplitude modulated wave.

b) Write down the advantages of S.S.B. modulation. 8+2=10

5. a) Design a 1:4 De-multiplexer tree and write the expression of output.

b) Describe the vestigial side band modulation technique.

c) Why VSB modulation is more efficient than S.S.B. modulation? 5+3+2=10

6. a) Show that the product of electron and hole concentration in a semiconductor is a constant at a given temperature.

b) Derive an expression for the width of depletion region across p-n junction in terms of impurity concentrations. 5+5=10

———————