P.G. 1st Semester - 2016

PHYSICS

(CBCS)

Paper : 104

Electronics & Instrumentation

Full Marks : 40 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) A Si diode has a saturation current of 0.15 pA at 27°C. Find the forward current of the diode when the forward bias is 0.6V.

   b) Realize an ideal band pass filter using low pass and high pass filters.

   c) Define deciBel(dB). What is the relation between dB and nepers?

   d) Simplify the logic function using Karnaugh maps

   $f = \bar{A}B\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + ABC + AB\bar{C} + A\bar{B}C$.

[Turn Over]

   e) Design 4 : 1 Mux

   f) The maximum and minimum value of a modulated AM wave are 1.6 and 0.4. Find out the index of modulation.

   g) The power of an unmodulated carrier is 1000 watt. Find the power in sideband and total power for 100% modulation.

   h) Intrinsic semiconductor is slightly n-type —Justify.

   i) Draw the I-v characteristic of an illuminated solar cell and shed the maximum power rectangle within it. 1+1

2. a) Derive the Telegrapher's equation of high frequency transmission line.

   b) Obtain an expression for the input impedance of a transmission line of length l, terminated by an impedance Z_R, in terms of secondary line constants.

   c) Show that under certain conditions, a lossless line can behave as a parallel resonant circuit. 3+4+3=10

3. a) Derive an expression for density of electrons in the conduction band for an n-type semiconductor and show the typical variation of conductivity with temperature. 4+1

b) What is junction capacitance of p-n junction? Show that it is eqivalent to the capacitance of two parallel plate capacitors separated with a distance. 1+4

4. a) Explain the operation of a balanced modulator for producing a suppressed carrier AM wave.

b) How can you detect DSB-SC type AM signals?

c) Why VSB+C type AM is used for picture signal in TV broadcasting? 4+3+3=10

5. What is single side band (SSB) modulation technique? Find out the frequency spectrum and time domain representation of the S.S.B. wave. Define modulation index for frequency modulation. 2+6+2=10

6. a) Using schematic band diagrams explain the current voltage characteristics of a tunnel diode.

b) Design a resistive attenuator capable of producing 20dB attenuation. The characteristic resistance of the attenuator should be 600Ω. 5+5=10
