M.Sc. Examination, 2018
Semester-I
Physics (Core)
Course: MPC-15
(Electronics)

Time: Three Hours **Full Marks: 40**

Questions are of value as indicated in the margin.
*Answer **any four** questions.*

1. Define a constant-K high pass filter.
   Derive an expression for the attenuation constant of a constant-K, T-section high pass filter in the attenuation band.
   A transmission system uses a high pass filter which passes all frequencies above 3 kHz. The resistive load at the output of the filter is 100 Ω. Design a constant-K, T-section high pass filter for this purpose. 3+4+3

2. What do you mean by 'primary constants' of a transmission line ?
   Derive Telegrapher's equations for a transmission line.
   How can a transmission line be made distortionless in practice? 2+5+3

3. Sketch a block diagrammatic representation of a second order phase-locked loop.
   Calculate the steady-state value of phase error in a second order PLL.
   How can you demodulate an FM signal with the help of a second order PLL? 2+4+4

4. What is a 'Gunn diode'?
   Can you realize Gunn action in a silicon device? Give reasons for your answer.
   Explain RWH mechanism to explain the manifestation of dynamic negative resistance in a Gunn diode.
   A Gunn diode operating in the transit time mode has a device length of 10 μm. The saturated electron velocity is 10^5 m/s. Calculate the Gunn oscillation frequency of the device. 2+2+4+2

5. What is meant by the term 'RADAR'?
   Why do the military aircrafts fly fast at very low altitudes?
   How does a pilot measure the height of the aircraft above the ground by using an FM radar?
   A pulsed radar operates with its transmitter frequency of 1 GHz. The pulse repetition frequency is 1 kHz. Find the first blind speed of this radar. 1+2+4+3

6. What is a 'Digital-to-Analog Converter'?
   Give the circuit diagram of a binary weighted N-bit DAC.
   Explain the operation of a binary weighted N-bit DAC.
   What are the disadvantages of this DAC?
   What is the advantage of a R-2R ladder type DAC over the binary weighted DAC? 1+3+3+2+1

7. Write notes on any two of the following: 5+5
   (a) Propagation constant of a symmetrical T-network.
   (b) Differential equation of a first order PLL.
   (c) Read diode.
   (d) Pulsed radar range equation.
