M.Sc. (Physics) 2nd Semester Examination – 2013

Electronic Devices and Circuits (PGP- 203)

Full Marks : 70 Time : 3 hours

Answer **Question No. 1** and any **four** from the rest:

1. Answer the followings:

a) Write a short note on tuned amplifier

b) Why compound semiconductor is preferred over the elemental Si ?

c) How can you make a JFET to work as a switch?

d) Compare the performance of JFET with that of MOSFET.

e) Write down the truth table of a Half – Subtractor and draw its circuit diagram.

4+2+2+2+4

2.a) Draw the circuit diagrams of a direct coupled and transformer coupled power amplifier .

b) Derive the expression for efficiency for both the amplifiers mentioned above.

c) Describe the process how the AC load line for a transformer coupled amplifier be drawn and Quiescent point be fixed for operation.

(1.5+1.5)+(4+4) +3

3. a) Derive the expressions for the voltage gain of an R-C coupled amplifier in mid, low and high frequency ranges. Plot the variation of phase angle between the input and output voltages of this amplifier with frequency. (Drawing of ac-equivalent circuit is essential for different frequency range).

9+5

4 (a) Discuss the working of a shunt voltage regulator using OPAMP. What are the disadvantages of the series and shunt regulators.

(b) What is three terminal integrated circuit adjustable voltage regulator? Discuss the overload protection of a power supply with a suitable circuit.

(5+2) +(4+3)

5. (a) What are the characteristics of coaxial cable?

(b) What are the differences between FM and AM ?

(c) Write down the requirements of FM demodulation. How does the simple slope detector work?

(d) A carrier wave of frequency 2MHz and amplitude 2V is frequency modulated by a sinusoidal signal of frequency 500Hz and of peak amplitude 1.5V.The frequency deviation is 1kHz . The level of modulating waveform is changed to 4V peak and the modulating frequency is changed to 2 kHz. Obtain the expression for the modulated waveform (FM).

2+3+5+4

6.a) Explain the basic operations with circuit diagram of an ENCODER and DECODER. Design a (4x16) Decoder from two (3X8) Decoders.

b). What is Multiplexer?

c). Implement the following function with a (8:1) Multiplexer.

$$F(A,B,C,D) = \Sigma\,(0,1,2,3,4,10,11,14,15),$$

Considering A, B, C as control switches. Also realize the same using a 16:1 MUX.

(3+3+2)+2+(3+1)=14

7.a) Explain the operation of a JKFF and construct a 4 bit SISO register with the help of it.

b) Explain the operation of an operational amplifier in relation to frequency response curve. Modify the circuit to explain its use as a High Pass Filter.

c) Explain the operation of 555-timer as an astable multivibraror with the help of circuit diagram.

(2+2)+(3+2)+5= 14