Electronics Engineering

Time: 3 hours   Full Marks : 200

Note : Question No. 1 is compulsory and any four from the remaining seven questions. All questions carry equal marks.

Q. No. 1. Attempt any 10 (ten)   10 X 4 = 40

A. Show how to implement an AND gate with NOT and OR gate.
B. Draw the schematic diagram of an ideal inverting Op-Amp with voltage shunt feedback and derive the expression for voltage gain.
C. Distinguish between intrinsic and extrinsic semiconductor. Are there any charge carriers in an intrinsic semiconductor?
D. State the reciprocity theorem and list down its applications.
E. Describe amplitude modulation and detection.
F. Differentiate hollow pipe waveguide from transmission line.
G. Write down the effect after execution of the following instructions of 8085.
   LDA 9000H   EI
   STAX B   LXI H, 2000H
H. Describe the working of a satellite. Why do geostationary satellites appear stationary to the earth?
I. What is device controller in a computer? Explain.
J. Differentiate between memory mapped I/O and I/O mapped I/O schemes.
K. What is Cache memory? Discuss.
L. What is the instruction set of a computer? How are they represented?

Q. No. 2. Attempt any 8 (eight)   8 X 5 = 40

A. Draw the piecewise linear volt-amplifier characteristic of a semiconductor diode. Also draw the circuit model for the ON state.
B. Explain base-width modulation or early effect in a BJT.
C. State the mass-action law and explain its meaning.
D. Calculate the value of volt equivalent of temperature at 27°c
E. Show how EX-OR function can be realized using NAND gates alone.
F. What do you mean by active and passive components? List three components of each category.
G. Differentiate between open loop control system and closed loop control system.
H. Define reflection co-efficient. Derive relation for reflection coefficient in terms of impedance of sending and receiving end.
I. What is sampling theorem and what does it determine? Define nyquist rate.
J. Why is interlaced scanning preferred over normal scanning in a TV?

Q. No. 3. Attempt any 5 (five)   5 X 8 = 40

A. Draw the circuit of a transistor in CE configuration. Also sketch the output characteristics and indicate the active, saturation and the cut-off regions.
B. Draw the circuit diagram of a TTL NAND gate and explain its operation.
C. Deduce the relationships between voltage (current) of the secondary and primary windings of a transformer in terms of turns ratio.
D. Discuss the types of losses that may occur with RF transmission lines. In what units are these losses normally given?

E. What is digital to analog conservation? Explain the operation of a successive approximation ADC with circuit diagram.

F. A lossy co-axial cable, operated at a frequency of 500 MHz, has the following primary constants:

G=0 ʊ/m   R=2.25 Ω/m   L=1 µH/m   C=100 pF/m

Determine the propagation constant and attenuation constant.

G. Write a program to multiply two BCD numbers stored in location 9000H and 9001H using repeated addition, in 8085 assembly language and store the result in memory location 9002H.

Q. No. 4. Attempt any 4 (four)   4 X 10 = 40

A. Draw the circuit diagram of a Master-Slave J-K flip-flop and explain its operation. How racing of flip-flop is eliminated in a M-S flip-flop?

B. List three sources of instability of collector current and define the three stability factors.

C. Explain the transient response in a series R-C circuit with dc input.

D. Explain the procedure for measurement of phase and frequency of a signal with the help of a CRO.

E. Explain the principle of working of a LVDT. Show how it can be used for the measurement of mechanical displacement.

Q. No. 5. Attempt any 2 (two)   2 X 20 = 40

A. Define: Transconductance g_m
                  Drain resistance r_d
                  Amplification factor μ

of a FET and give their relationships. Also draw the equivalent circuit of an FET.

B. Draw the circuit diagram of a square wave generator using OP-Amp. Explain its operation and derive the frequency expression in terms of circuit components.

C. An AC voltage v(t)=10sin1000t is applied across a series combination of 4 ohm resistance, 5mH inductance and 500µF capacitor. Determine the current and voltage across each element. Also draw the phasor diagram and calculate real, reactive and apparent power.

Q. No. 6. Draw the small signal high frequency CE model of a transistor and derive the expressions for A_I, A_v, R_i, r_o of a CE amplifier.   (40)

Q. No. 7. Design a 8085 microprocessor based temperature monitoring and controlling system. Draw the complete circuit diagram along with 8085µp, 8255, sensors, ADC, relay, display etc, etc. Also write the program for displaying the temperature and controlling the same.   (40)

Q. No. 8. Write short notes on any four (4) of the following topics   4 X 10 = 40

(a) Radar navigation   (e) PID control
(b) Accuracy & resolution   (f) Superheterodyne receiver
(c) Error detection & correction   (g) Universal shift register
(d) Synchronous counter   (h) Hertzian dipole