SUBJECT: BASIC ELECTRONICS ENGINEERING

Part-I

Q1 Answer the following questions: (2 x 10)

a) Explain the depletion region in p-n diode.

b) Differentiate between clipper and clamper circuit.

c) Why the emitter region of a transistor is more heavily doped than the base region?

d) “BJT is current controlled while FET is voltage controlled”. Justify.

e) Mention advantages and limitations of integrated circuits.

f) Draw the equivalent circuit of ideal Op-Amp.

g) What is CMRR in Op-Amp? Mention its value in ideal Op-Amp.

h) Determine the hexadecimal equivalent of 26.25.

i) State and prove De Morgan’s theorem.

j) Discuss Absorption theorem present in Boolean algebra.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

a) Draw the equivalent circuit of Si p-n diode. Discuss the procedure to find the equivalent circuit.

b) With neat circuit diagram, describe the operation of bridge rectifier. Calculate its PIV.

c) Show the width and doping profile of a transistor. Justify your answer. Draw the symbol of p-n-p and n-p-n transistor.

d) Discuss how a transistor can be used as a voltage amplifier.

e) For an n-channel D- and E-MOSFET

I. Draw the structure and corresponding symbol.

II. Draw Drain and transfer characteristics curve with proper voltage and current notations.

III. Mention output current expression.

f) Explain the principle of operation of a digital inverter.

g) I. If $\beta = 16.5$, IE = 1.8 mA and ICO = 12µA, calculate IC and IB when the transistor is used in the CE configuration.

II. For a p-n-p transistor in CE mode, $\beta = 100$. What is the value of α? If ICO = 10µA,

III. What is the collector current for an emitter current of 2 mA?

h) Draw inverting configuration using Op-Amp. Calculate the voltage gain of the circuit for υi = 150 mV rms, Rf = 75 KΩ and Ri = 36 KΩ. For the same parameter, calculate the voltage gain of non-inverting amplifier.

i) Compute the output voltage of the circuit shown in figure-1 for Vin1 = 0.2 V, Vin2 = – 0.5V, Vin3 = 0.8V, R1 = 33KΩ, R2 = 22KΩ, R3 = 12 KΩ, and R4 = 68 KΩ. Figure-1

j) I. Subtract (29)10 from (15)10 using 2's complement method of subtraction.

II. Subtract (25)10 from (8)10 using 1's complement method of subtraction.

k) Convert the following:

I. (FACE) 16 = (?)10

II. (65.45)10 = (?)2

III. (1111011011011.11011)2 = (?)8

l) With circuit symbol, Boolean expression and truth table explain all logic gates.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the Ge-diode characteristics under forward and reverse biased conditions. Draw the V~I characteristic curve. Indicate important voltage and current parameter. Compare the V~I curve to that of a Si diode. Mention some application of diode. (16)

Q4 Explain with a neat sketch, the structure and the working of a n-channel JFET. Draw its drain and transfer characteristic curve. Mention its application. (16)

Q5 Describe the use of operational amplifier as inverting and non-inverting amplifier. (16)

Q6 f 1 = _ __ _
(16)

f2 =

(i) Simplify the above functions. Draw the original and simplified circuit.

(ii) Express f1 and f2 in standard SOP form.

(iii) Express f1 and f2 in standard POS form.