Total No. of printed pages = 8

19/3rd Sem/UIE302

2021

ELECTRONIC DEVICES AND CIRCUITS

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) What is fermi level ? How fermi level is positioned in Intrinsic, N-type and P-type semiconductor ? 5

   (b) What are drift and diffusion of carriers in semiconductor ? Derive the Einstein's relation for Diffusion. 8

   (c) State and explain Hall effect in Semiconductor. 7

2. (a) What is built in potential ? Why it cannot be measured using voltmeter or multimeter ? 2+2=4

   (b) Derive the expression for built in potential and space charge width of an abrupt pn junction under zero bias condition. 10

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(c) Define one sided junction, linearly graded junction and hyper abrupt junction 6

3. (a) How a diode works in zero bias, forward bias and reverse bias condition ? 6

(b) Draw the circuit diagram and output waveforms of Positive simple series clipper and Positive biased series clipper. 6

(c) Determine the following for the fixed-bias configuration of Fig.1 8

(i) IBQ and ICQ, (ii) VCEQ,

(iii) VB and VC, (iv) VBC.

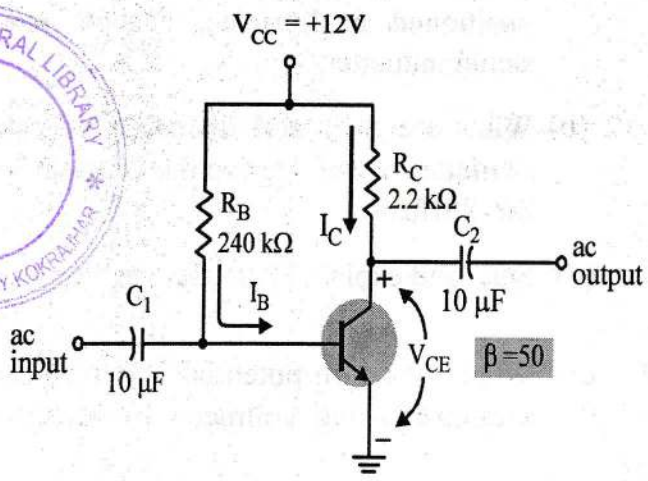

Fig. 1

4. (a) Given the load line of Fig. 2 and the defined Q-point, determine the required values of VCC, RC, and RB for a fixed-bias configuration. 6

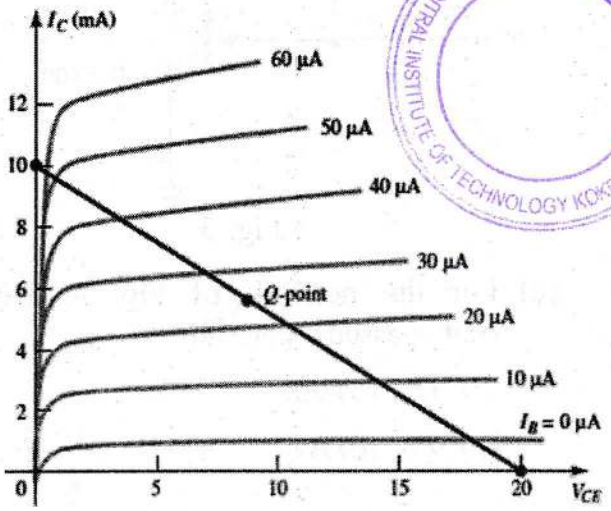

Fig. 2

(b) For the network of Fig. 3 : 7

(i) Determine re.

(ii) Find Zi (with ro = infinity).

(iii) Calculate Zo (with ro = infinity).

(iv) Determine Av (with ro = infinity).

(v) Repeat parts (c) and (d) including ro = 50k in all calculations and compare results.

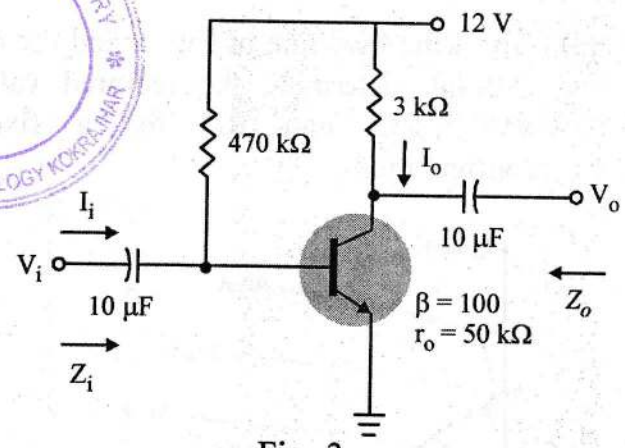

Fig. 3

(c) For the network of Fig. 4, without CE (unbypassed), determine : 7

(a) re, (b) Zi,

(c) Zo, (d) Av.

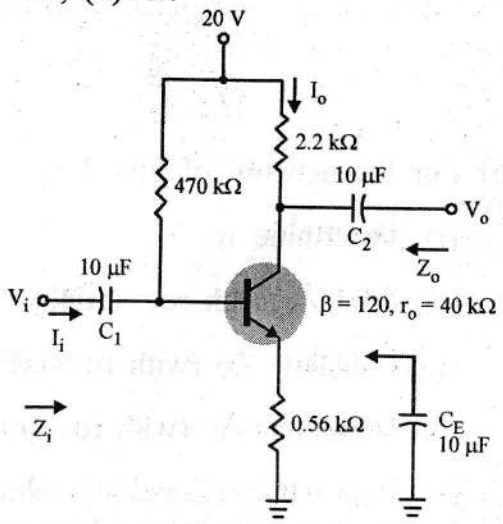

Fig. 4

5. (a) Determine the following for the network of Fig. 5 : 6

(a) VGSQ, (b) IDQ,

(c) VDS, (d) VD,

(e) VG, (f) VS.

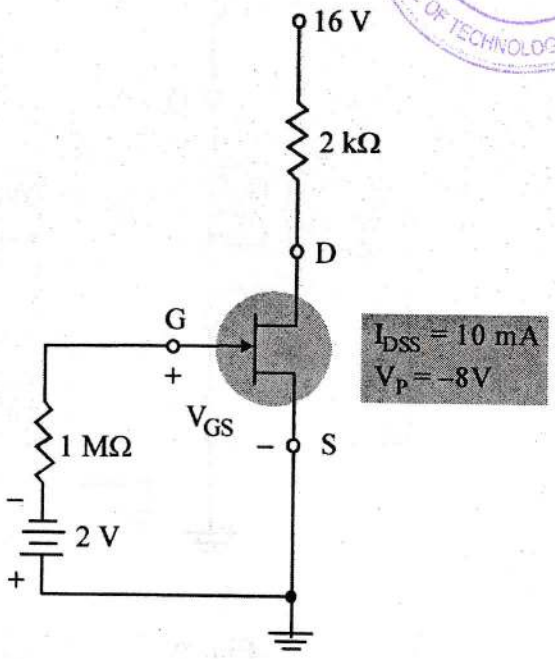

Fig. 5

(b) Determine VDS for the network of Fig. 6. 4

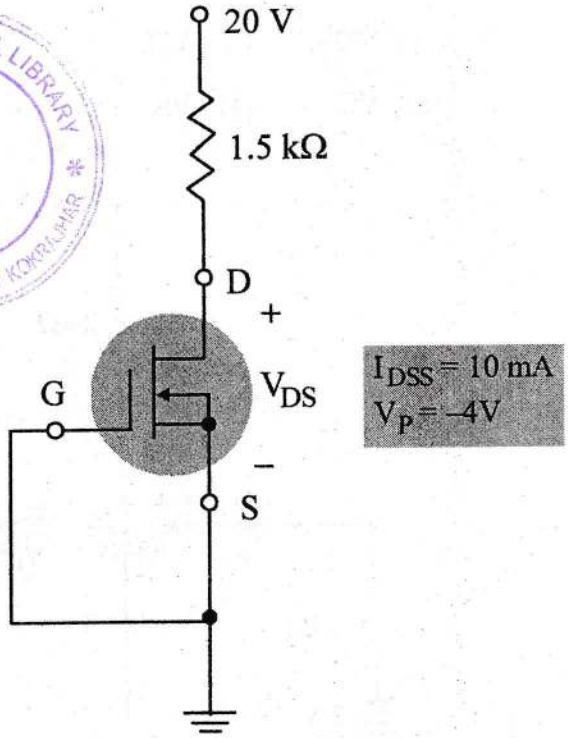

Fig. 6

(c) Determine IDQ, VGSQ, and VDS for the network of Fig. 7. 10

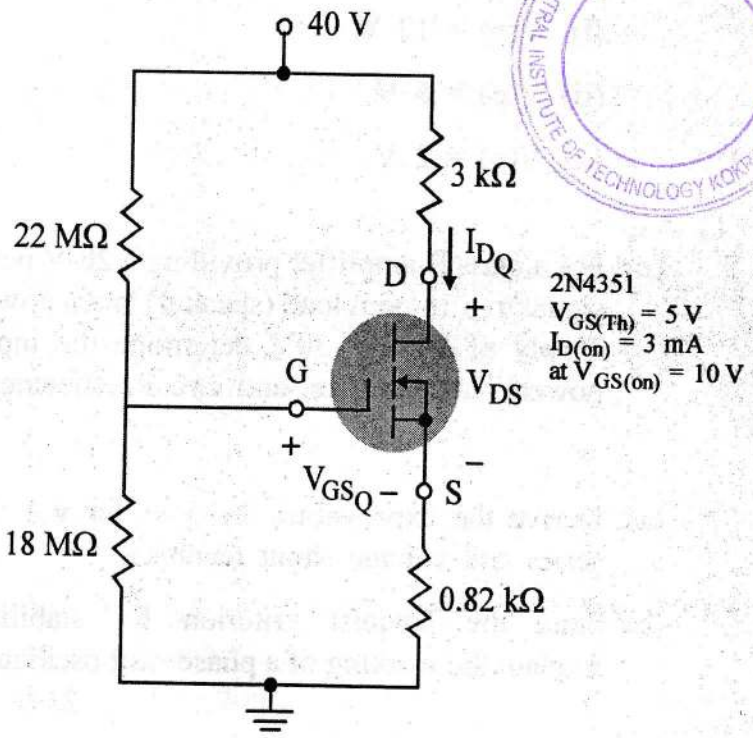

Fig. 7

6. (a) Determine the maximum efficiency of a series fed class A amplifier. 8

(b) Calculate the efficiency of a transformer-coupled class A amplifier for a supply of 12V and outputs of : 6

(i) V(p) = 12 V.

(ii) V(p) = 6 V.

(iii) V(p) = 2 V

(c) For a class B amplifier providing a 20-V peak signal to a 16 ohm load (speaker) and a power supply of VCC = 30V, determine the input power, output power, and circuit efficiency. 6

7. (a) Derive the expressions for gain for voltage series and voltage shunt feedback 5+5=10

(b) State the Nyquist criterion for stability. Explain the working of a phase shift oscillator. 2+8=10