NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
Department of Electronics and Communication Engineering

Autumn, Mid Semester Examination, October 2023

B. Tech(H), 1st Year,1st Semester
(ME, MME, PIE and ECM)

Course Code: EC1101
Course Name: Electronics and Instrumentation

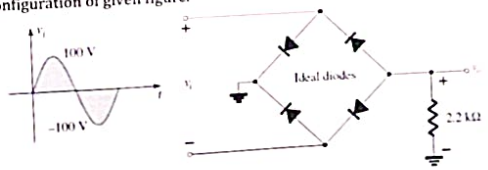
Time: 2 Hours, M. Marks: 30

Name of Faculty: Dr. Arjun Kumar(ECE)
Dr. Amit Kumar (ECE)
Dr. Chandra Deep Singh (ECE)

INSTRUCTIONS:
I. Answer all the questions.
II. Marks of the question and part thereof are indicated in the right hand margin.
III. Missing data, if any, may be assumed suitably.
IV. Write your Roll No. on each sheet of the answer
V. Before attempting the question paper, be sure that you have got the correct question paper
VI. Answer of each group should be written at one place

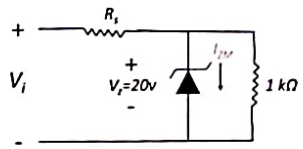
Q. 1 **a.** What is the one important difference between the characteristics of a simple switch and those of an ideal diode? **(5.0)**
b. Determine the thermal voltage for a diode at a temperature of 20°C.
c. For the same diode of part (b). find the diode current if I_s (reverse saturation current) is 40 nA, η=2, and the applied bias voltage is 0.5 V.

Q. 2 Discuss the full wave (Center Taped) and Bridge type rectifier circuit? Obtained the mathematical expression and numerical value for the circuit of the following. (a) V_{DC} (b) V_{RMS} (c) *Form-factor* (d) *Ripple Factor*. Determine V_0 and the required PIV rating of each diode for the configuration of given figure. **(5.0)**



Q. 3 Write a short note on any of the three from the following: - **(6.0)**
a. Direct and Indirect Band gap Semiconductor
b. Junction Capacitance in Diode
c. Diffusion current and Drift current density
d. Zener and Avalanche Breakdown

Q. 4 Discuss the construction and working principle of Zener diode? Design a voltage regulator that will maintain an output voltage of 20 V across a 1-kΩ load with an input that will vary between 30 V and 50 V. That is, determine the proper value of R_s and the maximum current I_{ZM} shown in figure. **(5.0)**



Q.5 Define clippers and clampers? Sketch i_R and v_0 for the network shown in the figure. **(4.0)**

Q.6 **a.** Why Silicon is preferred over Germanium semiconductor? **(5.0)**
b. Define Fermi energy level. Explain the effect of temperature and doping concentration on fermi level for n-type semiconductor.

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NATIONAL INSTITUTE OF TECHNOLOGY JAMSHEDPUR
Department of Electronics and Communication Engineering

Autumn, End Semester Examination, December 2023

B. Tech(H), 1st Year, 1st Semester
(ME, MME, PIE and ECM)

Course Code: EC1101
Course Name: Electronics and Instrumentation

Time: 3 Hours, M. Marks: 50

Name of Faculty: Dr. Arjun Kumar(ECE)
Dr. Amit Kumar (ECE)
Dr. Chandra Deep Singh (ECE)

INSTRUCTIONS:
I. Answer all the questions.
II. Marks of the question and part thereof are indicated in the right hand margin.
III. Missing data, if any, may be assumed suitably.
IV. Answer of each group should be written at one place

Q. 1 **a.** What is Base Width Modulation or Early Effect in BJT ? **(2.0)**

b. What is Pinch-off voltage in JFET? **(2.0)**

c. Draw XOR and XNOR gate using NAND gate. **(2.0)**

d. Simplify the function $Y = \bar{A}B(\bar{D} + \bar{C}D) + B(A + \bar{A}CD)$ **(2.0)**

e. An Aluminum strip has resistivity of $3.44 \times 10^{-8}\ \Omega m$ cross-sectional area $2 \times 10^{-4}\ mm^2$ and length of 5 mm. Find the voltage drop across the thickness if current of 50 mA passing through it. **(2.0)**

Q. 2 Why DC Biasing is required in BJT? Discuss the collector-to-base bias configuration of BJT and derive the stability factor of this configuration. **(5.0)**

Q. 3 Discuss the layout structure and working principle of n-channel JFET with its characteristic curve. **(5.0)**

Q. 4 Discuss the working principle of common emitter configuration of Bipolar junction transistor (BJT) with its input and output characteristics curve. **(6.0)**

Q. 5 Write short notes on the following: **(4.0)**
(a) DC load line
(b) Enhancement type MOSFET
(c) Stability Factor in BJT
(d) Explain why NAND gate is considered as universal gate and also write truth table of NAND gate

Q. 6 Describe the working of cathode ray oscilloscope (CRO) with the complete block diagram of cathode ray tube (CRT). **(5.0)**

Q. 7 **(a)** What are Sensors and Transducer? Write the basic difference between Sensors and Transducer. **(3.0)**

(b) Explain Inverting and Non-inverting OP-Amp with proper circuit diagram. **(2.0)**

Q. 8 Determine I_{CQ}, V_{CEQ} and I_{BQ} for the network shown in the figure 1 using **(5.0)**
(a) Exact analysis,
(b) Approximate analysis
(c) Compare the solution and comments on whether the difference is sufficiently large.

Q. 9 For the network shown in the Figure 2, determine: **(5.0)**
(a) V_G
(b) I_{DQ} and V_{GSQ}
(c) V_D and V_S
(d) V_{DSQ}

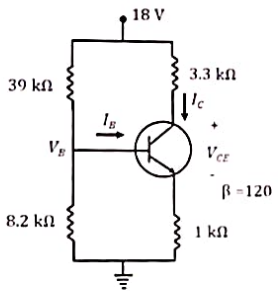

Figure: 1

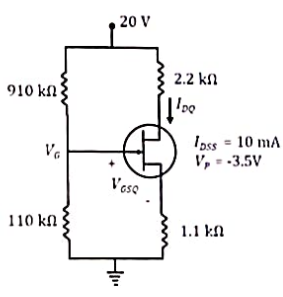

Figure: 2

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