

10

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)  
ORGANISATION OF ISLAMIC COOPERATION (OIC)  
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid-Semester Examination

Winter Semester, A. Y. 2022-2023

Course No.: EEE-4331

Time: 90 Minutes

Course Title: Basic Electronics and Semiconductor Physics

Full Marks: 75

There are 4 (four) questions. Question 1 is compulsory. Answer any 2 (two) questions from the other 03 (three). Marks in the margin indicate full marks. Do not write on this question paper.

- 1. a) Adding impurities to the intrinsic semiconductor materials will increase the conductivity - Explain the reason. 3  
(CO1, PO1)
- b) Explain the reason of reverse saturation current of a P-N junction diode under reverse biasing condition. 3  
(CO1, PO1)
- c)  $V_{input} = V_m \sin(2\pi ft)$  where  $f = 100\text{MHz}$ . If this input is provided to a half wave rectifier, where diodes are P-N junction diode will you receive your desired output? If your answer is "No" then write down the solution. 4  
(CO1, PO1)
- d) Determine the value of N1 and N2 for the Fig. 1(d) where input is 440V (rms) AC and the dc output voltage is 25 V. Sketch the output waveshape  $V_O$  with proper labelling for the given input. (All diodes are ideal diode.) 15  
(CO2, PO2)

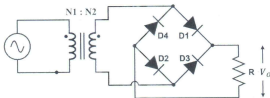


Fig: 1 (d)

- 2. a) The threshold voltage of a Ge diode is lower than the threshold voltage of a Si diode - Explain the reason. 7  
(CO1, PO1)
- b) Determine  $I, I_{D1}, I_{D2}, V_O$  for the Fig. 2(b). Use constant voltage drop model for the diodes. 9  
(CO2, PO2)

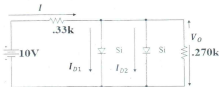


Fig: 2 (b)

- c) i) For the network of Fig: 2(c), determine the range of  $R_L$  and  $I_L$  that will result in  $V_{R_L}$  being maintained at 10 V. 9  
(CO2, PO2)
- ii) Determine the maximum wattage rating of Diode.

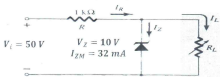


Fig. 2 (c)

3. a) Explain the working principle of a PNP Bipolar Junction Transistor.

7  
(CO1,  
PO1)  
18  
(CO2,  
PO2)

b) Determine  $I_C$ ,  $V_{CE}$  and  $V_C$  for the following circuits of Fig. 3 (b).  $\beta = 140$  for both NPN Bipolar Junction Transistor. Here  $V_{CC} = 20V$ .

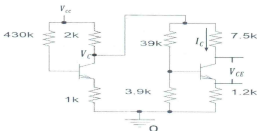


Fig. 3 (b)

4. a) Sketch the circuit of Common Emitter configuration. Explain the reason - when  $V_{CE}$  increases  $I_B$  decreases gradually for input characteristic graph of common emitter configuration.

7  
(CO1,  
PO1)

b) Sketch  $V_O$  for the following circuits of Fig. 4(b) (i), 4(b) (ii), 4(b) (iii). Here  $V_{in} = 20\sin\omega t$ ,  $V_1 = V_2 = 4V$  and  $V_3 = 5V$ . Assume all the diodes are ideal diodes. Show necessary steps.

6+6+6  
(CO2,  
PO2)

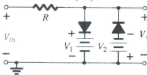


Fig. 4 (b) (i)

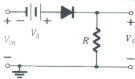


Fig. 4 (b) (ii)

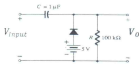


Fig. 4 (b) (iii)