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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 4383

Time: 90 Minutes

Course Title: Electronic Devices and Circuits

Full Marks: 75

There are 3 (three) questions. Answer all 3 (three) questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets.

1. a) Sketch the effect of an increasing level of  $R_C$  on the load line and the Q point in output characteristics curve of BJT. 05  
(CO1, PO1)
- b) Write down BJT's different modes of operation and mention their corresponding junction biasing with application. 05  
(CO1, PO1)
- c) For the network of Fig. 1(c1): 15  
(CO2, PO2)
- i. Sketch the load line on the characteristics for the transistor appearing in Fig. 1(c2).
  - ii. For a Q-point at the intersection of the load line with a base current of  $15 \mu A$ , find the values of  $I_{CQ}$  and  $V_{CEQ}$ .
  - iii. Determine the beta ( $\beta$ ) at Q-point.
  - iv. Using the beta ( $\beta$ ) for the network determined in part iii, calculate the required value of  $R_B$ .

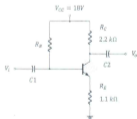


Fig. 1(c1)

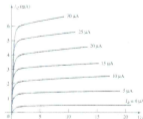


Fig. 1(c2)

2. a) Explain three types of equivalent circuits of silicone diode and sketch their corresponding V-I characteristics curve. 06  
(CO1, PO1)
- b) Show that the DC value of a full-wave rectifier's output is approximately 0.636 times the peak voltage,  $V_m$ . 07  
(CO2, PO2)



Fig. 2(b)

- c) For the network of Fig. 2(c2):
- Calculate  $5\tau$
  - Compare  $5\tau$  to half the period of the signal
  - Sketch  $V_o$  (show necessary calculation)

12  
(CO2,  
PO2)



Fig. 2(c1)

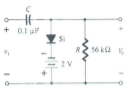


Fig. 2(c2)

3. a) The transistor in the circuit shown in Fig. 3(a) has  $\beta=100$  and exhibits a  $V_{BE}$  of 0.7V at  $i_C = 1$  mA. Design the circuit so that a current of 2 mA flows through the collector and a voltage of +5 V appears at the collector.

15  
(CO3,  
PO3)



Fig. 3(a)

- b) Sketch the circuit given in Fig. 3(b) by substituting the  $r_o$  transistor model of BJT in ac equivalent circuit.

10  
(CO2,  
PO2)

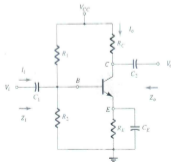


Fig. 3(b)