B.Sc. Engg. (EE) 2nd Semester Date: February 14, 2022

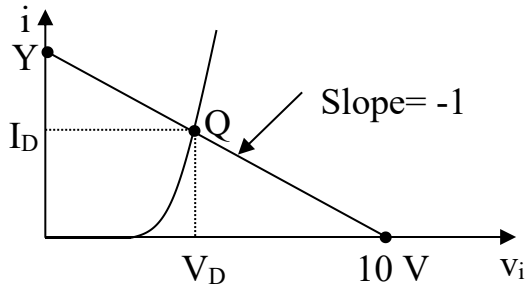
ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
THE ORGANISATION OF THE ISLAMIC COOPERATION (OIC)

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

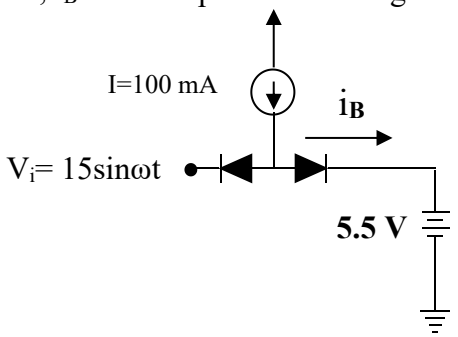
Mid Semester Examination — Summer Semester, A.Y. 2020-2021
Course No.: EEE 4203 — Time: 90+15 Minutes
Course Title: Electronics I — Full Marks: 75

Question No. 2 has an alternative to answer. Assume reasonable value for any missing data. Programmable calculators are not allowed. Figures in the margin indicate marks of the part questions. Do not write on this question paper.

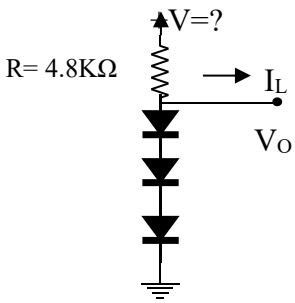
1(a) Draw the circuit diagram that includes a diode and which exhibits the following current voltage characteristic. Find (i) the value of Y. (ii) if an arbitrary co-ordinate of the diode is given as 1mA of current at a voltage of 0.7 V and the diode characteristic is such that its voltage drop changes by 0.1 V for every decade change in current find the co-ordinates of Q by iterative analysis. — 08 CO1 PO1,PO2



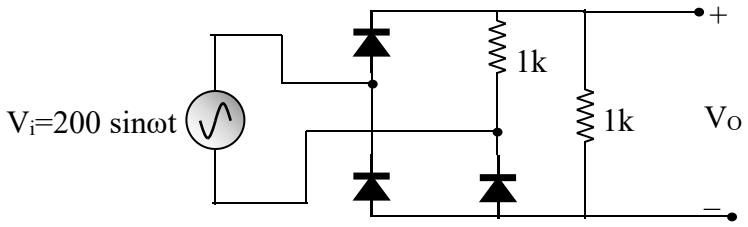
(b) For the circuit shown in the following figure, sketch and label the waveform of battery current, i_B. Find its peak and average values. — 08 CO2 PO1,PO3



(c) Design the following regulated circuit that provides an output voltage V_O=2.1 volt for no load condition. The voltage V_O changes by 30 mV per 1 mA change of load current. Assume n=1. — 09 CO1 PO1,PO2



2. (a) Following circuit can be used to have dc power supply. Draw the wave shape of the output voltage V_o of the following rectifier circuit and find the average value of the output voltage to get a primitive power supply. — 12.5 CO2 PO1,PO3

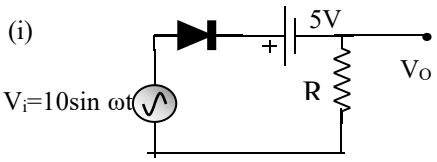


(b) Design a 7.5 V zener regulator circuit using 7.5 V zener specified at 12 mA. The zener has an incremental resistance r_z=30 Ω and a knee current of 0.5 mA. The regulator operates from a 10 V supply and has 1.2 k Ω load. Design the value of R (you may assume any current through it but zener should be in the breakdown). Find the output voltage with no load conditions. What is the smallest possible load resistor that can be used while the zener operates at a current no lower than the knee current while the supply is 10% low? — 12.5 CO3 PO1,PO5

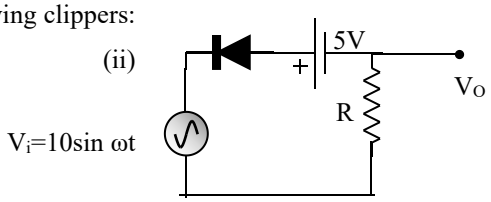
OR

2.(a) Find the output wave shapes for the following clippers: — 12.5 CO2 PO1,PO3

(i)

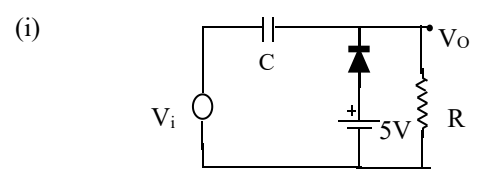


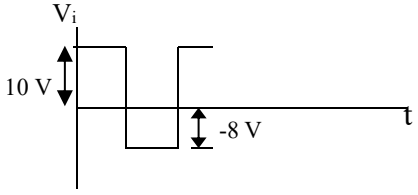
(ii)



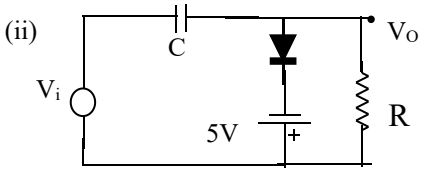
(b) Find the output wave shapes for the following clampers: — 12.5 CO3 PO1,PO5

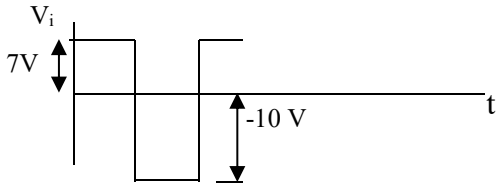
(i)





(ii)





3.(a) An *npn* transistor having $I_S = 10^{-15A}$ and $\beta = 100$ is connected as follows: The emitter is grounded, the base is fed with a constant-current source supplying a dc current of 10 μA, and the collector is connected to a 5-V dc supply via a resistance R_C of 3 k. Assuming that the transistor is operating in the active mode, find base to emitter voltage V_{BE} and collector to emitter voltage V_{CE}. Use these values to verify active-mode operation. Replace the current source with a resistance connected from the base to the 5 V dc supply. What resistance value is needed to result in the same operating conditions? — 13 CO4 PO1,PO4

(b) Find I_E and V_O of the following circuit. Assume β is very large (α is close to 1) for the BJT used in the circuit. — 12 CO5 PO1,PO9, PO12