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

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Mid Semester Examination   Summer Semester, A.Y. 2021-2022
Course No.: EEE 4203   Time: 90 Minutes
Course Title: Electronics I   Full Marks: 75

There are **3(four)** questions. **Answer all 3 (three) questions taking options in question** 1. 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.

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1. (a)   (i) Determine the value of V_O and I of circuit shown in Fig. 1(a).   [08]
         (ii) For the circuit shown in Fig. 1(b) sketch and label the waveform of battery   [CO1,
         current, i_B. Find its peak and average values.   PO1]
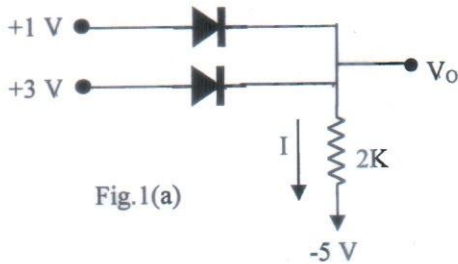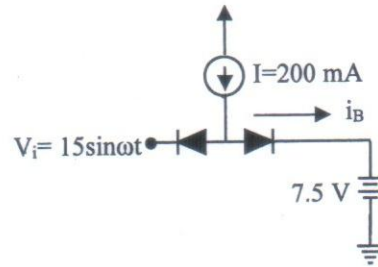

Fig.1(a)

Fig.1(b)

   (b)   Design the circuit of Fig. 1(c) to provide an output voltage of $V_o = 3.4$ V. The i-v   [08]
         characteristics of the diode is shown in Fig. 1(d).   [CO1,
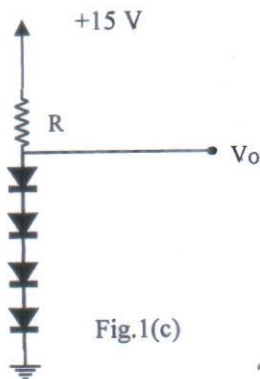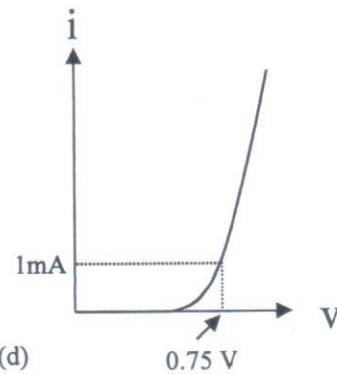   PO1]


Fig.1(c)

Fig.1(d)

   (c)   The diode equation for a forward biasing condition is given by $i_D = I_s e^{V_D/nV_T}$.   [09]
         Using this equation, find the expression of small signal resistance of the diode.   [CO1,
                                                                                               PO1]

OR

1. (a) A bridge rectifier is supplying a dc current of 100 mA to a resistive load at 3.2 V dc. [08] Suppose the rectifier is connected to an ac supply of 230 V (rms) of 50 Hz through a step [CO1, down transformer. Sketch the circuit diagram to find (i) the turn ratio of the transformer, PO1] (ii) PIV of each diode and (iii) the rms value of the current through the diodes.

(b) A shunt regulator utilizes a zener diode whose voltage is 6.8 V at a current of 5 mA and [08] whose incremental resistance is 10 Ω. The diode is fed from a supply of 10 V nominal [CO1, voltage through a 200 Ω resistor. Find the output voltage at no load? Find the load PO1] regulation if the load draws a current of 1 mA.

(c) Design the following regulator circuit (determine R_S and I_{ZM}) that will maintain an output [09] voltage of 20 V across a 1 kΩ resistor load with an input that will vary between 30 and 50 [CO1, V. PO1]
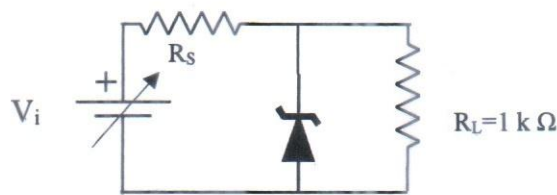
2. (a) Find the output voltage wave-shapes for the following clippers (diodes are ideal): [13] [CO2, PO1]
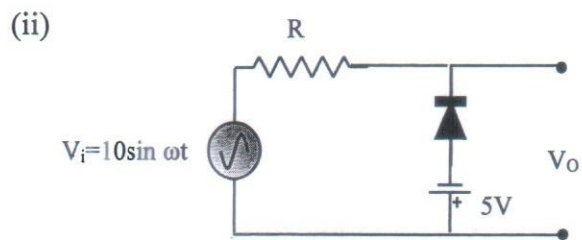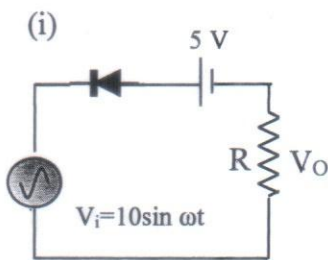
(b) Find the output voltage wave-shapes for the following clampers (diodes are ideal): [12] (i) [CO2, PO1]
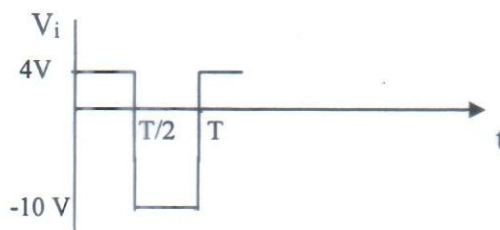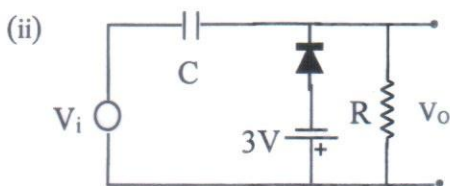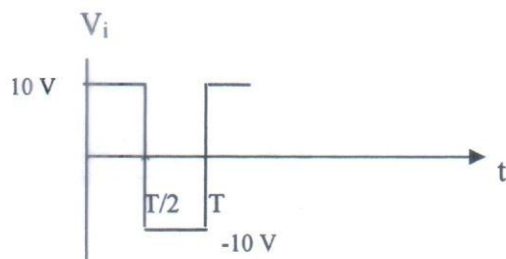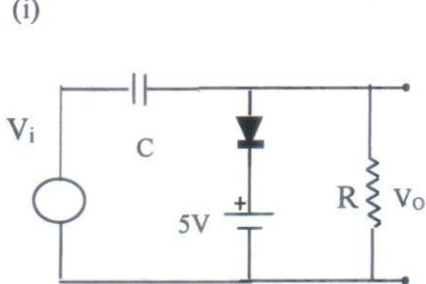
3. (a)   Write down the importance of biasing of Emitter-Base junction and Collector-Base Junction of an NPN BJT from the application point of view. [08]
[CO1, PO1]

(b)   Draw the basic structure of an npn transistor and explain how various currents are generated due to flow of carriers. If both junctions are reverse biased of the transistor what will happen to the currents? [08]
[CO1, PO1]

(c)   Design the circuit in the following figure to establish $I_C = 0.2$ mA and $V_C = 0.5$ V. The transistor exhibits v_{BE} of 0.8 V at $i_C = 1$ mA, and $\beta = 100$. [09]
[CO2, PO1]

+1.5V

R_C

R_E

-1.5 V