DEPARTMENT OF ELECTRONIC AND ELECTRICAL ENGINEERING

Spring Semester 2007 (30 minutes)

EEE 103 ANALOGUE CIRCUITS MID TERM TEST

Answer **ALL** questions. **The numbers given after each section of a question indicate the relative weighting of that section.**

REGISTRATION NUMBER:.....

WRITE YOUR ANSWERS ON THIS QUESTION PAPER

1 State the direction of conventional forward current flow (ie, "**A** to **B**" or "**B** to **A**") through the diode of figure 1. ***{1 mark}***

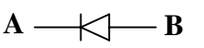


figure 1

Q1 Ans

2 In figure 2, D has a forward voltage drop of 0.7V. If V_i = 6V, will the diode be conducting? If the diode is conducting, what is its forward current? If the diode is not conducting, what is its reverse bias voltage? ***{2 marks}***

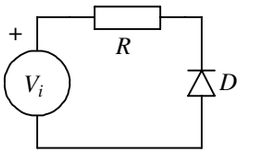


figure 2

Q2 Ans

3 In the circuit of figure 3 the diode has a forward voltage drop of 0.7V. At what value of V_i is the diode on the point of changing state from conducting to non-conducting? What is the value of I_D if V_i = 6V? ***{2 marks}***

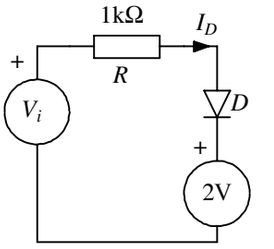


figure 3

Q3 Ans

4 On the graph of V_i in the **Q4** answer box, sketch the response, V_O, of the circuit of figure 4 to the input voltage, V_i, shown. What is the circuit time constant? ***{3 marks}***

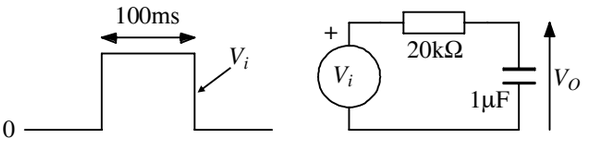
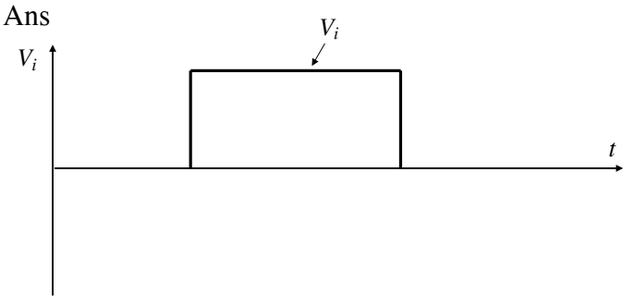


figure 4

Q4 Ans



$\tau =$

5 On the graph of V_i in the **Q5** answer box, sketch the response, V_O, of the circuit of figure 5 to the input voltage, V_i, shown. Label peak values. Would the output change if $V_S = 100$V and $V_P = 120$V? ***{4 marks}***

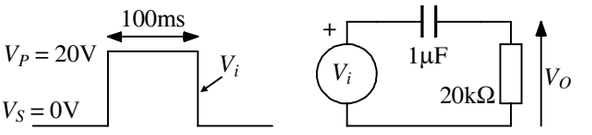
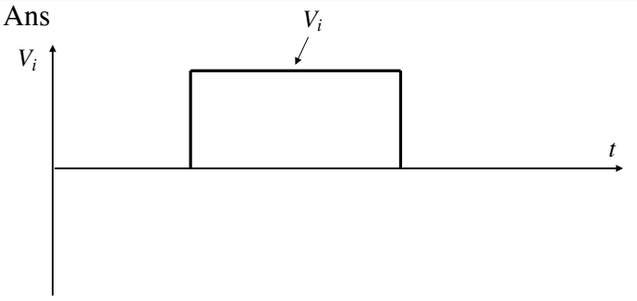


figure 5

Q5 Ans



change

no change

(tick or circle as appropriate)

6 On the axes in the **Q6** answer box, sketch the response, V_O, of the circuit of figure 6 to a unit step input - ie, a step change from $V_i = 0$V to $V_i = 1$V at $t = 0$. Write down V_O as a function of time for $t \geq 0$ using the appropriate numerical value for τ. ***{4 marks}***

A general exponential response is given by

$V(t) = (V_{START} - V_{FINISH}) \exp(-t/\tau) + V_{FINISH}$

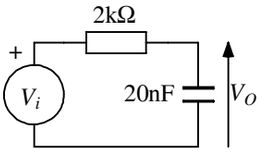
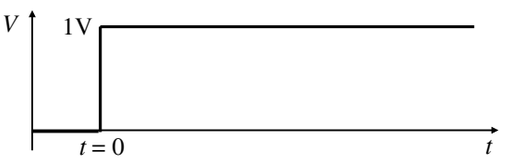


figure 6

Q6 Ans



$V_O(t) =$

7 The diode in figure 7 has a forward voltage drop of zero. On the axes in the **Q7** answer box, sketch the response of the circuit of figure 7 to the input pulse shown. Write down the rising and falling edge time constants in the boxes provided. ***{3 marks}***

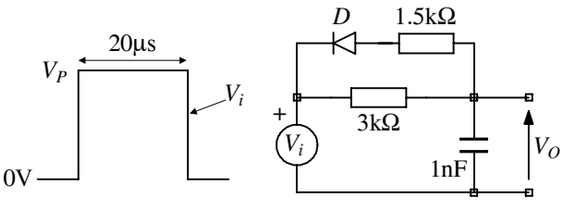
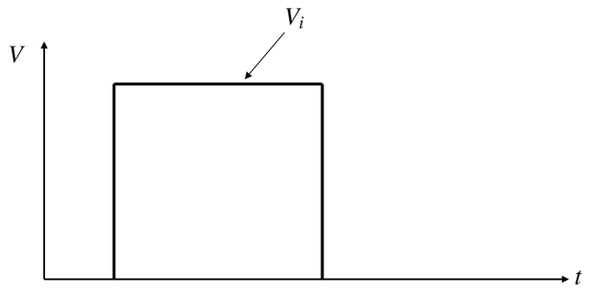


figure 7

Q7 Ans



rising edge time constant =

falling edge time constant =

8 Draw a diode clamp circuit. ***{2 marks}***

Q8 Ans

9 On the axes in the **Q9** answer box, sketch the form of V_O that you would expect from figure 9, with and without C included in the circuit. What is the peak value of V_O? ***{3 marks}***

Q9 Ans

$V_{O\ PEAK}$ =

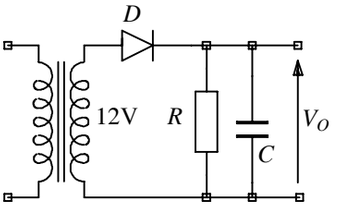


figure 9

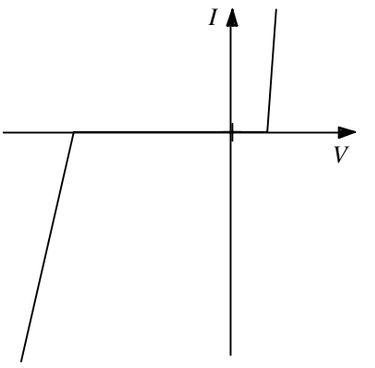


figure 10

10 Annotate the *I-V* Zener diode characteristic of figure 10 with the 0.7V forward turn on voltage and the reverse (Zener) breakdown voltage. Indicate the region of the characteristic normally used for Zener diode applications. Draw the circuit symbol of a Zener diode. ***{4 marks}***

Q10 symbol