بسم الله الرحمن الرحيم

Ministry of Higher Education
King Fahd University of Petroleum & Minerals
Electrical Engineering Department

وزارة التعليم العالي
جامعة الملك فهد للبترول و المعادن
قسم الهندسة الكهربائية

ELECTRONICS I

First Major Exam

EE 203 – Winter 2008 (072)

Wednesday, March 19th, 2008

18H00 – 19H30 (1 hour – 30 minutes)

Name _____

Student ID _____

Section _____4_____

Examiner – Dr. Alaa El-Din Hussein

- This exam contains **four questions** and is composed of 5 pages including this cover page. Partial point distribution is indicated between brackets. Please pace yourself accordingly.
- This is a **CLOSED book** examination.
- Make sure to **state all assumptions** you find necessary to complete your answer.
- Show **all** your work. Partial credit will be given. If you think you need something that you can't remember, write down what you need and what you'd do if you remembered it.

Question #	Question 1	Question 2	Question 3	Question 4	Total
Mark					
Total Mark	10	10	10	10	40

الظهران ٣١٢٦١ ● المملكة العربية السعودية ● تلفون : ٨٦٠-٢٢٧٧ (٠٣) ● فاكس : ٨٦٠-٣٥٣٥ (٠٣) ● تلكس : ٨٠١٩٥٠ جافهد ● برقياً : الجامعة
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Question 1: Choose the correct answer only and record it in the table below: [10 Marks]

1. The voltage drop across a reverse biased silicon diode is about:
   a) 0.0V b) -0.7V
   c) 0.7V d) Unknown

2. The current in the forward p-n junction far away from the junction is mainly
   a) diffusion current b) drift current
   c) displacement current d) Unknown

3. Assuming a Zener diode with V_Z=10V at I_{ZT}=10m.A, and r_Z=50Ω. If the diode has a forward current of 5 m.A the diode voltage will equal to:
   a) 9.75V b) 0V
   c) -9.75V d) 0.7V

4. In a forward biased pn junction the electrons current in the p side near the junction is
   a) drift current b) diffusion current
   c) displacement current d) convection current

5. For p^+n junction (the doping in the p side is much higher than n side) the depletion layer will be:
   a) mainly in the n region b) mainly in the p region
   c) equal in both sides d) zero

6. Zener diodes are normally used as:
   a) D.C Amplifiers b) A.C Amplifiers
   c) current regulators d) voltage regulators

7. The threshold voltage for the N-channel depletion MOSFET is
   a) less than zero b) more than zero
   c) exactly zero d) slightly more than zero

8. What is the relation between the diffusion current and the electric field?
   a) It is directly proportional b) It is inversely proportional
   c) There is no relation d) It is inversely or directly proportional depends on the carriers charge

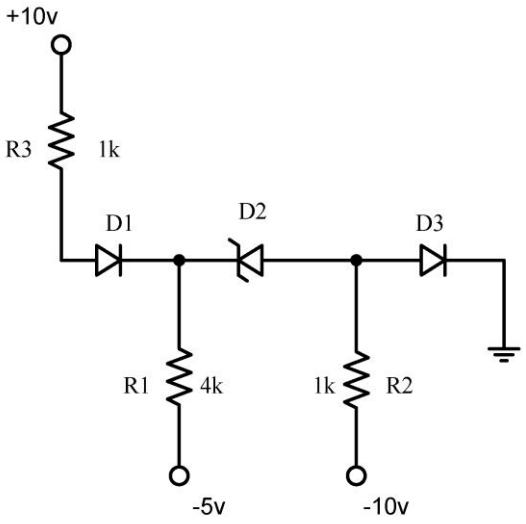
9. The depletion NMOS drain current in the saturation region is:
   a) diffusion current b) drift current
   c) displacement current d) convection current

10. The current in the MOSFET at normal operation is carried by:
   a) electrons only b) holes only for N-channel and electrons only for P-channel
   c) both electrons and holes at the same time d) electrons only for N-channel and holes only for P-channel

Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Answer										

Question 2: **[10 Marks]**

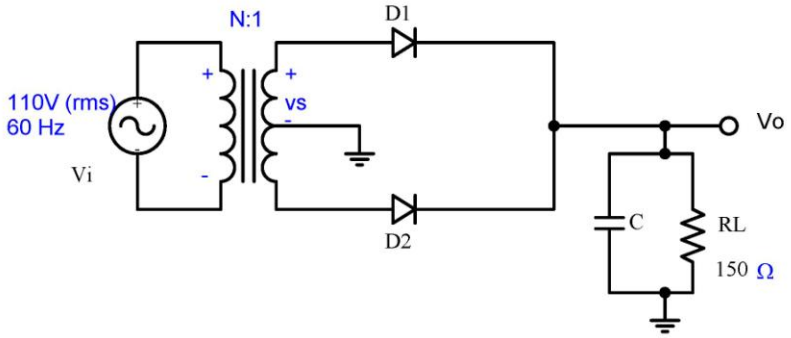
Find the Q-points ($I_{D,}$ V_D) for all the diodes in the shown circuit using the constant voltage drop model with V_D = 0.7V. For the zener diode V_Z = 4.7V and r_z = 0 Ω.



Question 3: **[10 Marks]**

It is required to use the shown rectifier circuit below to design a DC power supply that provides an average DC output voltage of 10V on which a maximum of ± 0.6V ripple is allowed. The available diodes have 0.7V drops when conducting.

a) What is the rectifier type (Full/Half) wave **[1 Mark]**
b) Specify the rms voltage that must appear across the transformer secondary (v_s). **[3 Marks]**
c) Specify the value of N for the shown transformer **[1 Mark]**
d) Find the required value of the filter capacitor. **[3 Marks]**
e) Find the maximum reverse voltage that will appear across the diode **[2 Marks]**



Question 3: **[10 Marks]**

For the shown transistor circuit assume that the threshold voltage V_{TN}= 1V, and the transconductance parameter k_n = 1 mA/V^2 .

a) Analyze the circuit to find the transistor operating point (I_D, V_{DS}). **[5 Marks]**
b) What is the transistor region of operation **[1 Marks]**
c) If R_{G2} is removed (open circuited), what will be the effect on the transistor region of operation?, calculate the new operating point **[4 Marks]**