INTERNATINONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY – HCMC

**Mid-term Examination**

**Date: March 30th , 2016**

**Duration:** 90 minutes

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| **SUBJECT: Electronic Devices** | |
| Dean of School of Electrical Engineering  Signature:  Full name: Tran Van Su | Lecturer: Tran Van Su, Msc.  Signature:  Full name: Tran Van Su |

**INTRODUCTIONS:**

1. Only one NOTE of A4-PAPER and calculators allowed during the exam. Books, other materials, and computers are prohibited.
2. Answer all questions.

**Question 1 (25 Marks)**

The Op-Amp used for the design has the approximated frequency response of the voltage gain shown in Fig. 1

80

0

100

106

Frequency, [Hz]

Voltage gain, [dB]

Fig. 1

1. Design and plot the inverting amplifier with input resistance of 4KΩ and the 3-dB frequency of 20KHz. (10 Marks)
2. Design and plot the circuit with the bandwidth of 106 Hz. (10 Marks)
3. Find the bandwidth of the amplifier if the voltage gain is 25dB. (5 Marks)

**Question 2 (25 Marks)**

An ideal op-amp is connected as Fig. 2a.

Fig. 2b

ω

Voltage gain [dB]

0

100

Fig. 2a

vin

R1

R

C

-\_

+

vo

1. If R1 = 0, design R to obtain the differentiator shown in Fig. 2b with C = 0.01µF. (10 Marks)
2. What is the amplitude and phase of the voltage gain at ω = 10 rad/s and at 1000rad/s for question a (R1 = 0). (5 Marks)
3. Determine R1 to limit the absolute of the high frequency gain with the value of R obtained from question 1. (10 Marks)

**Question 3 (25 Marks)**

Fig. 3

VDC = 2V

iAC = 0.002cos(ω t) (A)

R1 = 500 Ω

D

R2 = 100 Ω

The constant-voltage-drop model is used for the diode (D) in Fig. 3 with VDo = 0.65V. The ideality factor n = 1.

1. Find the current iD. (10 Marks)
2. Find the voltage vD. (10 Marks)
3. Compute the DC and AC power dissipated on Diode. (5 Marks)

**Question 4 (25 Marks)**

A zener diode exhibits a constant voltage of 7.5 V for current not less than 6 mA. It is to be used in the design of a shunt regulator shown in Fig. 4. The load current varies over the range 0 to ILmax.

1. Find ILmax. (10 Marks)
2. If IL = 10 mA, compute the maximum power dissipation of the zener diode? (5 Marks)
3. Compute the power dissipated on R if iL = 0. (5 Marks)
4. If IS varies from 20mA to 30 mA and IL varies from 5mA to 20mA. Determine R. (5 marks).

IS = 30 mA

R = 1kΩ

Vz

iL

Fig. 4