Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01 A/B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 7
SEMESTER 1, ACADEMIC YEAR 2016/2017
Date: 5 September 2016 Time: 15 minutes

Question:

Refer to **Figure 1**. Op-amp is ideal. Given $\boldsymbol{R_1}$ **= 50 kΩ**, $\boldsymbol{R_2}$ **= 125 kΩ,** $\boldsymbol{R_3}$ **= 20 kΩ**, $\boldsymbol{R_4}$ **= 125 kΩ.**

(a) **Calculate** closed-loop voltage gain $A_v = v_O / v_I$ of the circuit. **[6 marks]**

(b) **Determine** maximum value of v_O when v_I **= 0.25 sin ωt (mV)**. **[4 marks]**

Show clearly all calculations in order to get full marks. Write values with proper Units.

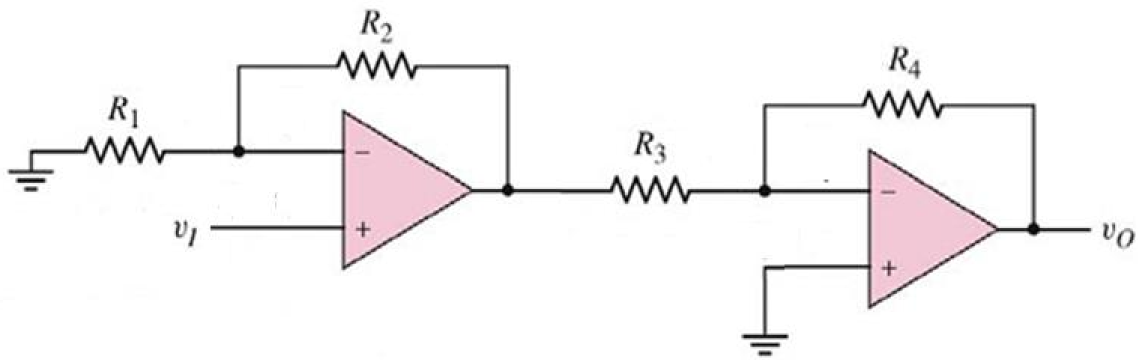

Figure 1

Answer:

(a)

$v_{O1} = (1 + R_2 / R_1) \times v_I \quad = (1 + 125k / 50k) \times v_I$

$v_{O1} = 3.5\, v_I$ **[2]**

$v_O = -(R_4 / R_3) \times v_{O1} \quad = -(125k / 20k) \times v_{O1}$

$v_O = -6.25\, v_{O1} \quad = -6.25 \times (3.5\, v_I) \quad = -21.875\, v_I$ **[3]**

$A_v = v_O / v_I \quad = -21.875$ V/V **[1]**

(b)

$v_O = -21.875\, v_I \quad = -21.875 \times 0.25 \sin \omega t$ (mV)

$v_O = -5.46875 \sin \omega t$ (mV) **[2]**

v_O **is maximum when sin ωt = -1**

$v_O = (-5.46875)(-1)$ mV $= 5.46875$ mV **[2]**

Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01 A/B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 7
SEMESTER 1, ACADEMIC YEAR 2016/2017
Date: 5 September 2016 Time: 15 minutes ,

Question:

Refer to **Figure 1**. Op-amp is ideal. Given R_1 = **40 kΩ**, R_2 = **130 kΩ,** R_3 = **25 kΩ**, R_4 = **120 kΩ.**

(a) **Calculate** closed-loop voltage gain $A_v = v_O / v_I$ of the circuit. **[6 marks]**

(b) **Determine** maximum value of v_O when v_I **= 0.15 sin ωt (mV)**. **[4 marks]**

Show clearly all calculations in order to get full marks. Write values with proper Units.

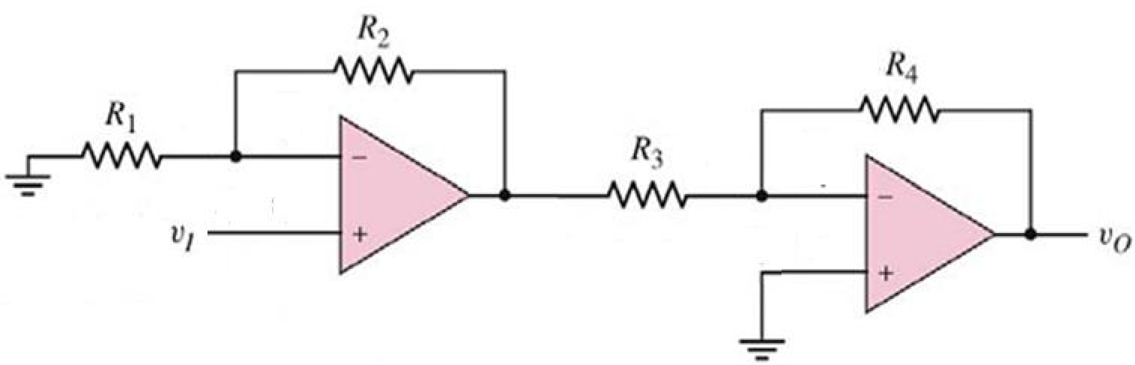

Figure 1

Answer:

(a)

v_{O1}	$= (1 + R_2 / R_1) \times v_I$	$= (1 + 130k / 40k) \times v_I$		
v_{O1}	$= 4.25\ v_I$			[2]
v_O	$= -(R_4 / R_3) \times v_{O1}$	$= -(120k / 25k) \times v_{O1}$		
v_O	$= -4.8\ v_{O1}$	$= -4.8 \times (-4.25\ v_I)$	$= -20.4\ v_I$	[3]
A_v	$= v_O / v_I$	$= -20.4$ V/V		[1]

(b)

v_O	$= -20.4\ v_I$	$= -20.4 \times 0.15 \sin \omega t$ (mV)	
v_O	$= -3.06 \sin \omega t$ (mV)		[2]

v_O **is maximum when sin ωt = -1**

v_O	$= (-3.06)(-1)$ mV	$= 3.06$ mV	[2]

Name:	**Dr JBO**
Student ID Number:	**Model Answer**
Section:	01 A/B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 7
SEMESTER 1, ACADEMIC YEAR 2016/2017
Date: 5 September 2016 Time: 15 minutes ;

Question:

Refer to **Figure 1**. Op-amp is ideal. Given $\boldsymbol{R_1}$ **= 30 kΩ**, $\boldsymbol{R_2}$ **= 135 kΩ,** $\boldsymbol{R_3}$ **= 35 kΩ**, $\boldsymbol{R_4}$ **= 175 kΩ.**

(a) **Calculate** closed-loop voltage gain $A_v = v_O / v_I$ of the circuit. **[6 marks]**

(b) **Determine** maximum value of v_O when v_I **= 0.24 sin ωt (mV)**. **[4 marks]**

Show clearly all calculations in order to get full marks. Write values with proper Units.

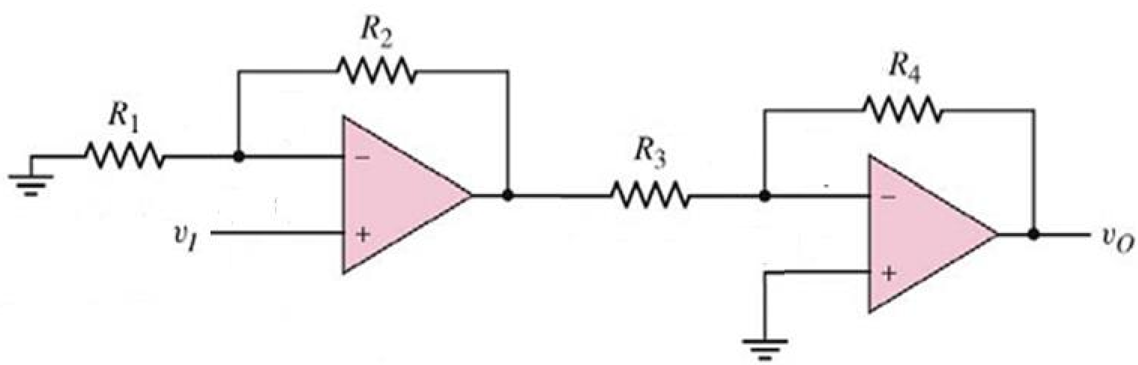

Figure 1

Answer:

(a)

$v_{O1} = (1 + R_2 / R_1) \times v_I \quad = (1 + 135k / 30k) \times v_I$

$v_{O1} = 5.5\ v_I$ **[2]**

$v_O = -(R_4 / R_3) \times v_{O1} \quad = -(175k / 35k) \times v_{O1}$

$v_O = -5\ v_{O1} \quad = -6 \times (5.5\ v_I) = -27.5\ v_I$ **[3]**

$A_v = v_O / v_I \quad = -27.5$ V/V **[1]**

(b)

$v_O = -27.5\ v_I \quad = -27.5 \times 0.24 \sin \omega t$ (mV)

$v_O = -6.6 \sin \omega t$ (mV) **[2]**

v_O **is maximum when sin ωt = -1**

$v_O = (-6.6)(-1)$ mV $= 6.6$ mV **[2]**

Name:	Dr JBO
Student ID Number:	Model Answer
Section:	01 A/B
Lecturer:	Dr. Jamaludin Bin Omar

EEEB273 - Quiz 7
SEMESTER 1, ACADEMIC YEAR 2016/2017
Date: 5 September 2016 Time: 15 minutes :

Question:

Refer to **Figure 1**. Op-amp is ideal. Given $\boldsymbol{R_1}$ **= 18 kΩ**, $\boldsymbol{R_2}$ **= 153 kΩ,** $\boldsymbol{R_3}$ **= 24 kΩ**, $\boldsymbol{R_4}$ **= 252 kΩ.**

(a) **Calculate** closed-loop voltage gain $A_v = v_O / v_I$ of the circuit. **[6 marks]**

(b) **Determine** maximum value of v_O when v_I **= 0.28 sin ωt (mV)**. **[4 marks]**

Show clearly all calculations in order to get full marks. Write values with proper Units.

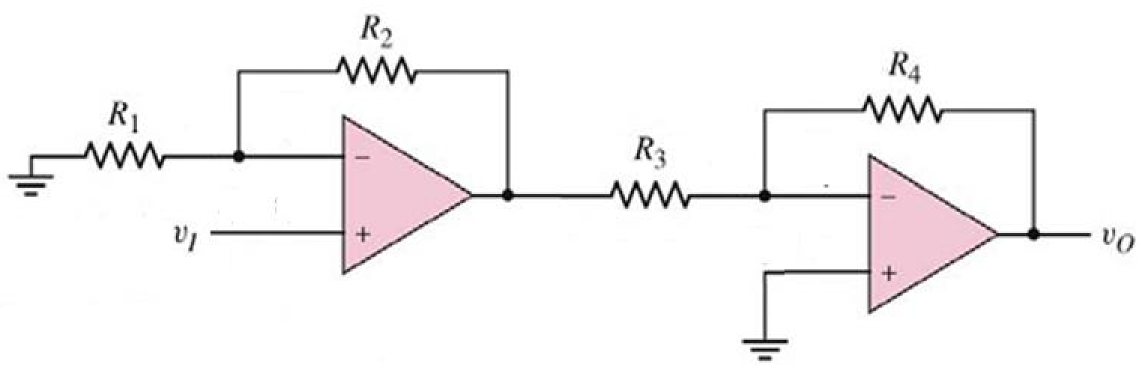

Figure 1

Answer:

(a)

v_{O1} $= (1 + R_2 / R_1) \times v_I$ $= (1 + 153k / 18k) \times v_I$

v_{O1} $= 9.5\, v_I$ **[2]**

v_O $= -(R_4 / R_3) \times v_{O1}$ $= -(252k / 24k) \times v_{O1}$

v_O $= -10.5\, v_{O1}$ $= -10.5 \times (9.5\, v_I)$ $= -99.75\, v_I$ **[3]**

A_v $= v_O / v_I$ $= -99.75$ **[1]**

(b)

v_O $= -99.75\, v_I$ $= -99.75 \times 0.28 \sin \omega t$ (mV)

v_O $= -27.93 \sin \omega t$ (mV) **[2]**

v_O **is maximum when sin ωt = -1**

v_O $= (-27.93)(-1)$ mV $= 27.93$ mV **[2]**