Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

The circuit in **Figure 1** is that of an operational amplifier being used as an inverting amplifier. The power supply to the amplifier is ±15 V.

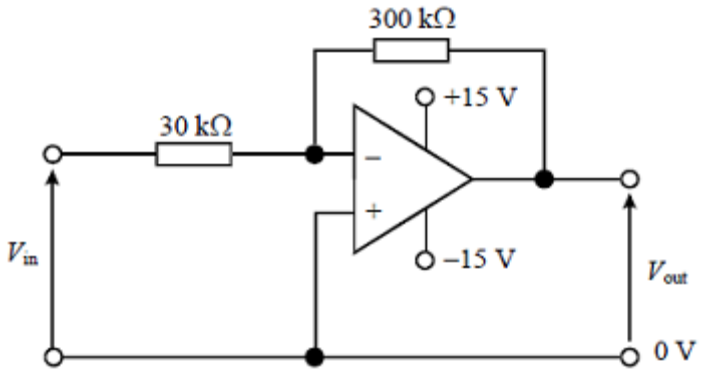

Figure 1

(a) (i) Calculate the voltage gain for the amplifier circuit.

_____

_____

(ii) The input signal is sinusoidal of peak voltage 1.0 V. The first graph in **Figure 2** shows the variation of the input signal. Sketch on the second set of axes the corresponding form of the output signal. Indicate values on the voltage axis.

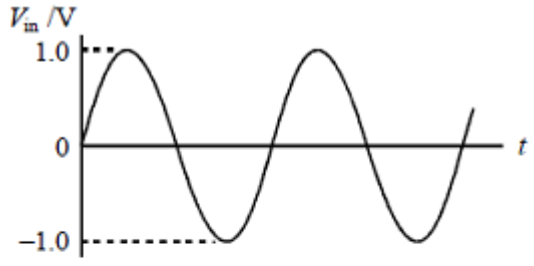

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Figure 2

(5)

(b) The feedback resistor is now changed for a resistor of resistance 600 kΩ. Sketch a graph on the axes in **Figure 3** showing the new output signal, for the same input waveform. Indicate values on the voltage axis.

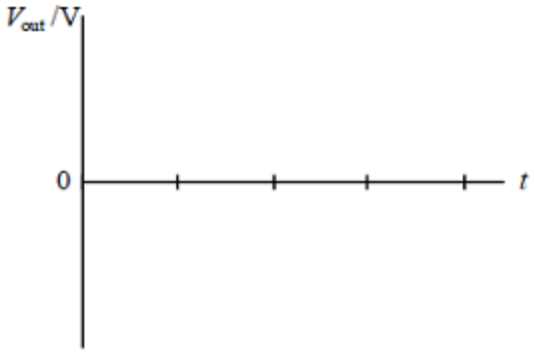


Figure 3

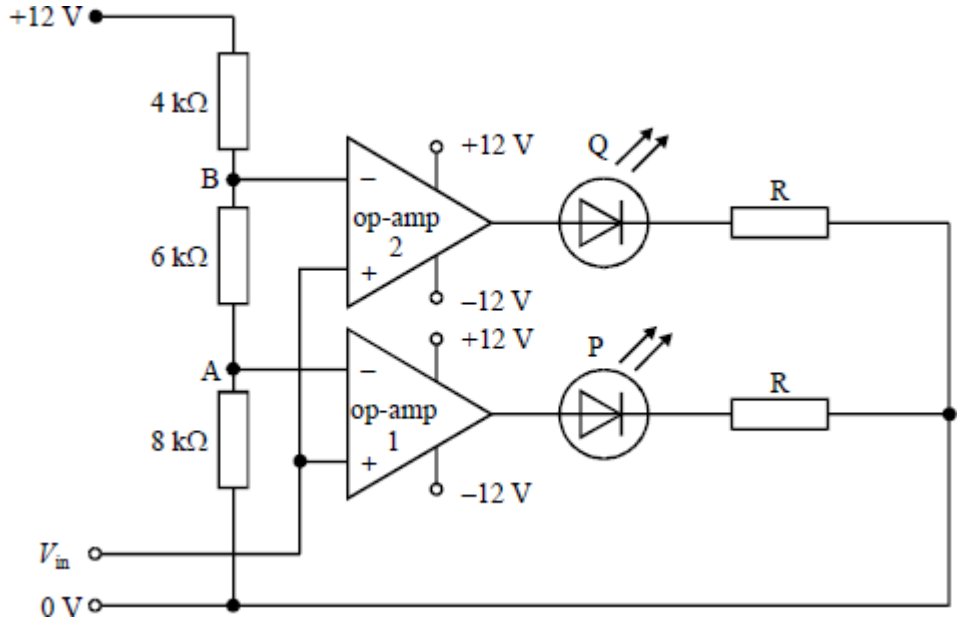
_____

_____

(2)

(Total 7 marks)

Q2.



(a) For the circuit shown calculate the voltage

(i) at the point A,

_____

_____

(ii) at the point B.

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_____

_____

(3)

(b) Describe, with a reason in each case, the state of each LED when V_{in} = 6.5 V.

(i) LED P _____

_____

_____

(ii) LED Q _____

_____

_____

(4)

(c) Determine the resistance of R needed to limit the current through either LED to 20 mA. Assume that the forward voltage drop across either LED is 16.V

_____

_____

_____

(2)

(Total 9 marks)

Q46.

Figure 1 shows the circuit of a summing amplifier which uses an operational amplifier with *negative feedback*. The power supply to the operational amplifier is ±12 V.

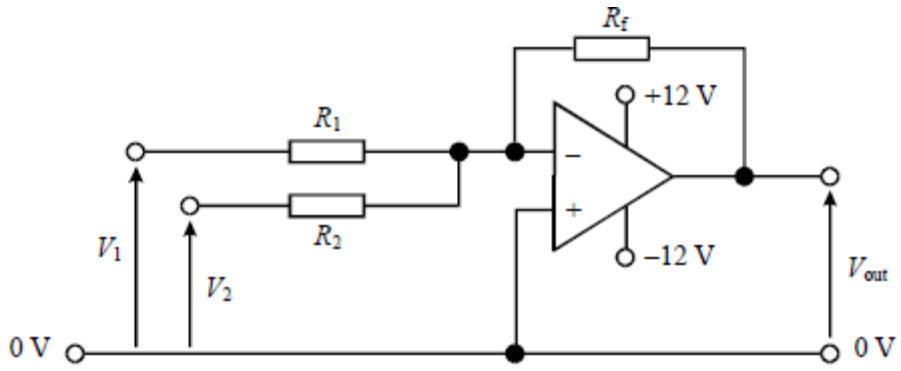

Figure 1

(a) (i) State what is meant by negative feedback. Explain how this is achieved in the above circuit.

_____

_____

_____

_____

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(ii) Give **two** reasons for using negative feedback in an amplifier.

_____

_____

_____

(4)

(b) The input voltages to the amplifier in part (a), V_1 and V_2, vary with time according to the graphs shown in **Figure 2**. Given that R_1 = 40 kΩ, R_2 = 20 kΩ and R_f = 40 kΩ show on the third set of axes the variation of V_{out} with time. Indicate values of V_{out} on the axis.

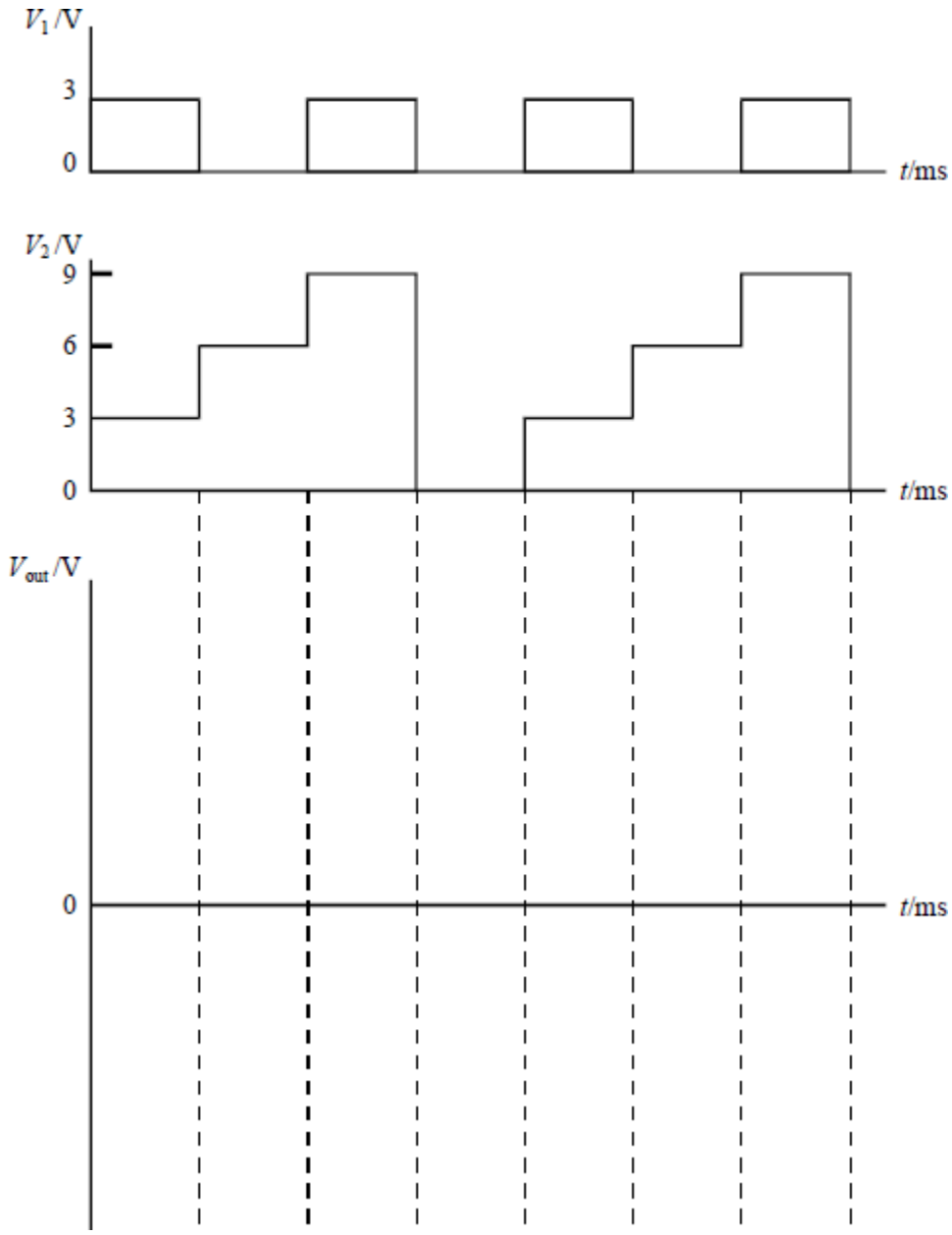

Figure 2

_____

_____

_____

(4)

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(Total 8 marks)

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