ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER – 2008

ELECTRONIC SYSTEM DESIGN

SEMESTER – 3

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct answer from the given alternatives for any *ten* of the following : $10 \times 1 = 10$

i) The gain of a OP-AMP is

a) low b) very low

c) high d) very high. ☐

ii) The input impedance of OP-AMP is

a) infinite b) zero

c) very high, but not infinite d) very small. ☐

iii) We are giving sine wave to the input of a differentiator, the output we get is

a) square wave b) triangular wave

c) cosine wave d) sawtooth wave. ☐

iv) Schmitt Trigger is used to

a) form sine wave

b) form square wave

c) convert irregular shaped waveform in square pulse

d) none of these. ☐

v) A filter that cannot pass only 3 kHz frequency signal is a

a) low-pass b) highpass

c) notch d) band-pass filter. ☐

vi) An OP-AMP has a slew rate of 5V/μs. The largest sine wave output voltage possible at a frequency of 1 MHz is

a) 5/2 volt b) 3/2 volt

c) 2 volt d) 3/8 volt.

vii) The voltage follower has a

a) small open loop voltage gain

b) closed loop voltage gain of unity

c) closed loop bandwidth of zero

d) large closed loop output impedance.

viii) The OP-AMP circuit shown in the fig. (1) is a filter, the type of filter and its cut-off frequency are respectively

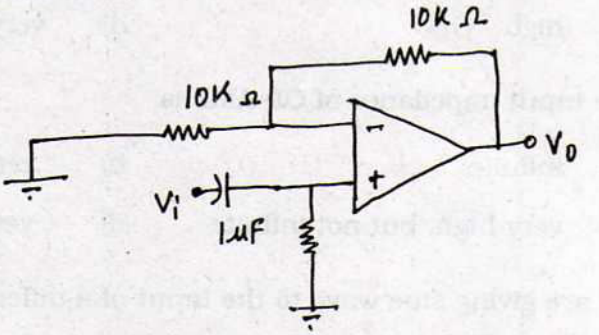

Fig. 1

a) high-pass, 1000 rad/s b) low-pass, 1000 rad/s

c) high-pass, 10000 rad/s d) low-pass, 10000 rad/s.

ix) For the circuit shown in fig. (2) $V_i = -0{\cdot}3$ V. The value of V_o is

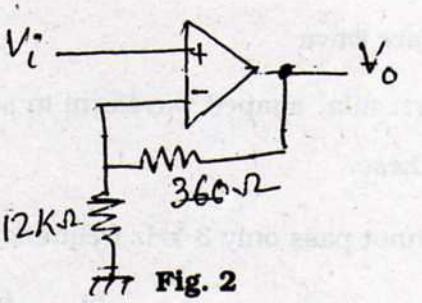

Fig. 2

a) – 9·6 V b) – 9·3 V

c) – 2 V d) – 10 V.

x) A band-pass filter is built by cascading a low-pass filter with a high-pass filter. Which filter has the lower cut-off frequency ?

a) The high-pass filter b) The low-pass filter

c) Neither of them d) Both of them combinedly. ☐

xi) For a non-inverting OP-AMP, which of the following statements is true ?

a) The closed loop gain is reduced by a factor β

b) CMRR is increased by a factor β

c) The bandwidth increased by a factor β

d) All of these. ☐

xii) A differential amplifier is used at the input stage of any operational amplifier to ensure

a) high CMRR b) Wide bandwidth

c) high slew rate d) high open loop gain. ☐

xiii) We can reject only one frequency by

a) LPF b) HPF

c) BPF d) Notch Filter. ☐

xiv) Astable multivibrator has

a) one quasi-stable state b) one stable state

c) no stable state d) none of these. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Draw a circuit diagram of a basic log amplifier using a transistor as the feedback element.

Derive the expression for the output voltage. What are the applications of log amplifier ? 2 + 2 + 1

3. Draw the circuit diagram and explain the principle of operation of a non-inverting comparator circuit. 5

4. Draw and explain the operation of window detector circuit. 5

5. Draw the circuit for an astable multivibrator using 555 timer to get 50% duty cycle. 5

6. Explain the operating principle of both voltage-to-current as well as current-to-voltage converters. 5

GROUP – C
(Long Answer Type Questions)

Answer any *three* questions. 3 × 15 = 45

7. a) Draw and explain Wien-bridge oscillator. 8

   b) Explain with diagram, the operation of a triangular wave generator. 7

8. Explain how to use the 555 timer as a voltage controlled oscillator.

   What do you mean by pH of a solution ? Describe the principle of the technique of pH measurement. 8 + 7

9. Explain what you mean by an active low-pass filter. Design a non-inverting low-pass filter circuit that has a gain of 10 at low frequencies, a high frequency cut-off point of 159 Hz and an input impedance of 10 kΩ. 5 + 10

10. Draw the 3-OP-AMP instrumentation amplifier circuit and derive its output voltage expression. What is the need of a variable resistance in the transducer bridge to make an instrumentation amplifier ? The following circuit (Fig. 3) shows a controlled gain amplifier. What is the gain of the amplifier circuit when

    i) switch S is off

    ii) switch S is on ?

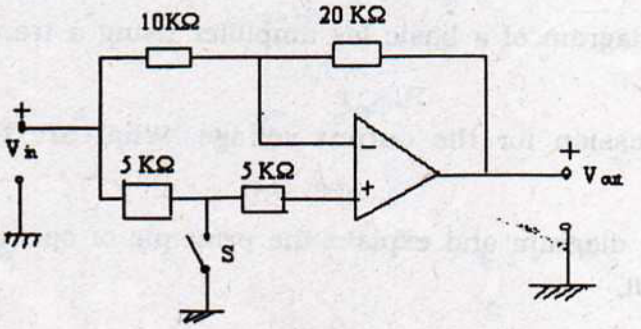

Fig. 3

3 + 5 + 2 + 5

$3 \times 5 = 15$

11. Write short notes on any *three* of the following :

a) Slew rate

b) CMRR

c) Precision rectifier

d) Strain gauge

e) Input offset voltage.

END