Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(EE)/SEM-1/CI-1.5.2/2009-10

2009

ELECTRONIC DEVICES & SYSTEMS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer Question No. 1 and any *four* from the rest. 5 × 14 = 70

1. i) Why CMRR should be kept very high for operational amplifier ?

   ii) Explain slew rate for operational amplifier.

   iii) Define *Q*-factor for a bandpass filter.

   iv) What is reverse recovery time of a power thyristor ?

   v) Why is isolation required in the gate driver circuit of an IGBT ?

   vi) What is Signal to Noise and Distortion (SINAD) ?

   vii) What is the function of MODEM ? 7 ∞ 2

2. a) Find out the amplitude and phase of the output signal from the following configuration of circuit.

$V_{in} = 10 \sin (10^5 u t)$ volts

b) Show the configuration of active notch filter. What is notch-out frequency of the filter ?

3. a) For the circuit given below derive the relationship between V_{in} and V_{out}. Also state how the circuit can be used as filter and indicate the type of the filter.

$$V_{in} = V_m \sin \omega t$$

b) Show the configuration of a bandpass filter. Define centre frequency and bandwidth of the same.

4. a) For the following amplifier derive the relationship between input and output.

b) For the following circuit show the output waveform.

$$v_i = 10 \sin 314\, t \text{ volts}$$

5. a) The following specifications are given for a dual input balanced output differential amplifier :

$R_C = 2{\cdot}2$ K, $R_E = 4{\cdot}7$ K, $R_{in_1} = R_{in_2} = 50\ \Omega$.

$V_{cc} = -V_{EE} = 10$ V, $\beta_{dc} = \beta_{ac} = 100$, $V_{BE} = 0{\cdot}7$ V.

Determine (i) voltage gain (ii) R_{in_1}, R_{in_2} and R_o .

b) Why is input impedance required to be high for operational amplifiers. Explain with diagram.

6. a) Define latching current and holding current for a thyristor. Which current is greater ?

A thyristor with latching current of 50 mA is triggered with a 50 μs pulse for the circuit shown below. Find out the max. value of R to ensure triggering.

b) State the conditions to commutate a thyristor. Also show the VI characteristics of a thyristor in the forward and reverse zone. Also show the same for a triac indicating difference between the two.

7. Write short notes on any *four* of the following : $4 \times 3\frac{1}{2}$

a) Resolution of an A/D converter

b) Quantization error of an A/D converter

c) Signal-to-Noise Ratio (SNR) of an A/D converter

d) Sampling rate of an A/D converter

e) Aliasing of an A/D converter

f) Total harmonic distortion of A/D converter.