

AMIETE – ET (OLD SCHEME)

Code: AE09
Time: 3 Hours

Subject: ANALOG & DIGITAL ELECTRONICS
Max. Marks: 100

DECEMBER 2010

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

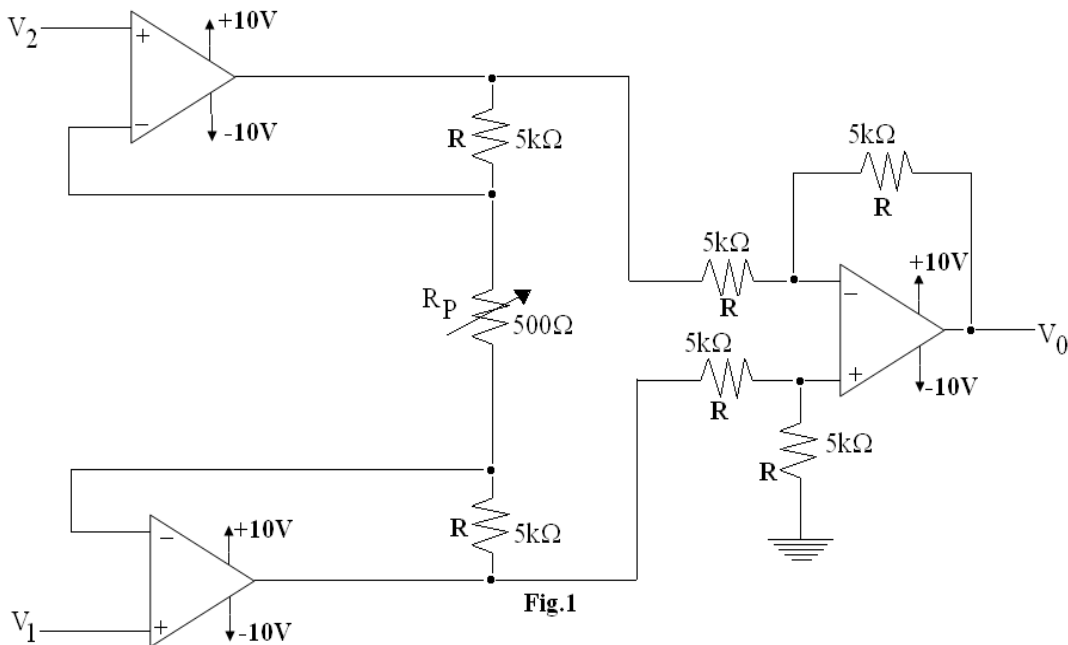
Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. In a differential amplifier, CMRR can be improved by using an increased
- (A) emitter resistance (B) collector resistance
(C) source resistance (D) power supply voltage
- b. Ability of an operational amplifier to provide sufficient differential mode signal but to reject the common mode signal is given by
- (A) Closed loop gain
(B) Open loop gain
(C) CMRR.
(D) none of the above.
- c. A notch filter is a
- (A) Wide band pass filter. (B) Narrow band pass filter.
(C) Wide band reject filter. (D) Narrow band reject filter
- d. The number of comparators required to build an eight-bit simultaneous or flash A/D converter is
- (A) 127 (B) 63
(C) 255 (D) 8
- e. A data selector is also called a
- (A) De-multiplexer (B) Priority encoder
(C) Multiplexer (D) Decoder
- f. In a 1:16 demultiplexer, the number of control inputs will be
- (A) 4 (B) 1
(C) 2 (D) 16

- g. Identify the slowest of the family listed below
- (A) LSTTL (B) TTL
(C) ECL (D) Low Power TTL
- h. The number of flip-flops needed to construct a BCD decade counter is
- (A) 4 (B) 3
(C) 10 (D) none of these
- i. Size of ROM required to implement a 16:1 multiplexer would be
- (A) 512k*2 (B) 1M*1
(C) 1M*2 (D) 128*6
- j. A dynamic RAM consist of
- (A) 6 transistors. (B) 2 transistors and 2 capacitors
(C) 1 transistors and 1 capacitors. (D) 2 capacitors only

**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

Q.2 a. Calculate the output voltage in terms of V_1 and V_2 as shown in Fig.1. (8)



- b. Define offset voltage and slew rate of an op-amp. (4)
- c. In context to frequency compensation, explain internal compensation & external compensation. (4)

- Q.3** a. Determine the order and 3 dB bandwidth of 1 dB ripple Chebyshev filter that gives a 40 dB attenuation at $\omega/\omega_c = 2$. (8)
- b. What are Switched-capacitor filters? List the advantages of switched-capacitor filters. (8)
- Q.4** a. The data sheet of a certain eight-bit A/D converter which have the following specifications:
 (i) resolution: eight bits
 (ii) full-scale error: 0.02% of full scale,
 (iii) full scale analogue input: +5V.
 Determine the quantization error (in volts) and the total possible error (in volts) (8)
- b. List the applications of Schmitt trigger circuit. (4)
- c. What is Schottky diode? Why it is also called hot-carrier diode? How does it differ in construction from a normal p-n junction diode? (4)
- Q.5** a. Design a two-input NOR and two-input NAND using NMOS logic. (8)
- b. Explain the working of BJT as an Inverter. (8)
- Q.6** a. Explain the working of CMOS as an inverter. (8)
- b. Give general properties of the FETs. (4)
- c. What is the function of buried layer in the fabrication of Bipolar transistor? (4)
- Q.7** a. How we interface the TTL-to-ECL family? (4)
- b. Give the applications of ROM memory. (4)
- c. Design a 16:1 multiplexer using two 8:1 multiplexer having an active-low ENABLE input. (8)
- Q.8** a. Design a MOD-10 Johnson counter and also write the count sequence for the same. (8)
- b. What is the race-around condition and how it can be eliminated? (8)
- Q.9** a. Describe the serpentine and LARAM organization of a CCD memory. (8)
- b. A combinational circuit is defined by the functions.
 $F_1(A, B, C) = \sum m(3, 5, 7)$
 $F_2(A, B, C) = \sum m(4, 5, 7)$
- Implement the circuit with a PLA having 3 inputs, 3 product terms and 2 outputs. (8)