

DipIETE – ET (NEW SCHEME)

Time: 3 Hours

JUNE 2012

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

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 45 minutes 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. For fabrication of integrated circuit, silicon is used because _____

- (A) it is mechanically strong.
- (B) it is more conductive semi-conductor material.
- (C) it possesses characteristics which are best suited to IC manufacturing processes.
- (D) it is black in colour.

b. The CE amplifier circuits are preferred over CB amplifier circuits because they have _____

- (A) lower amplification factor.
- (B) larger amplification factor.
- (C) high input resistance and high output resistance.
- (D) None of these.

c. A FET is essentially a _____

- (A) Current driven device.
- (B) voltage driven device.
- (C) power driven device.
- (D) None of these.

d. The main function of a transformer employed at the output of a power amplifier is _____.

- (A) to increase the voltage gain.
- (B) to set up the voltage and power.
- (C) to match the load impedance with the dynamic output impedance of the transistor for maximum power transfer.
- (D) to safeguard the transistor against overheating .

Code: DE56**Subject: ANALOG ELECTRONICS**

- e. The Light Emitting Diode (LED) _____
(A) is usually made from metal oxide.
(B) used in reverse biased junction.
(C) gives a light output which increases with temperature.
(D) emits light due to recombination of holes and electrons.
- f. The gain of an inverting amplifier is given as _____
(A) $-\frac{R_f}{R_i}$ (B) $\frac{R_i + R_f}{R_i}$
(C) $-\frac{R_f}{R_i}$ (D) $\frac{R_f}{R_i}$
- g. If a square wave is fed to a op-amp differentiator circuit, the output will be _____
(A) Sharp narrow pulses. (B) triangular wave.
(C) saw tooth wave. (D) sine wave
- h. A multivibrator that generates square wave of its own is called a _____
(A) Monostable multivibrator. (B) Bistable multivibrator
(C) Astable multivibrator. (D) None of these.
- i. The output voltage of a 7908 IC voltage regulator is _____
(A) +8 V (B) -8 V
(C) +18 V (D) -18 V
- j. The fastest analog to digital converter technique is _____
(A) Parallel Comparator. (B) Successive approximation.
(C) Dual Slope. (D) Counting type.

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

- Q.2** a. List the various techniques available for fabricating IC resistors and describe thin film resistor technique in detail. (8)
b. What is meant by photolithography and explain the photolithography process in brief. (8)
- Q.3** a. Draw the h-parameter equivalent circuit for CE circuit with unbypassed emitter resistor and derive an expression for its voltage gain. (8)
b. A CB amplifier having the following h-parameters as $h_{ie} = 2.1 \text{ k}\Omega$ and $h_{fe} = 75$. If $R_C = 3.9 \text{ k}\Omega$, $R_E = 4.7 \text{ k}\Omega$ and $R_L = 82 \text{ k}\Omega$, then calculate
(i) h_{ib} (ii) h_{fb}
(iii) Z_i (iv) A_v (8)

Code: DE56

Subject: ANALOG ELECTRONICS

Q.4 a. Draw the drain characteristic for $V_{GS} = 0$ for an n-channel JFET. Identify regions and explain the shape of the characteristic. (8)

b. The following readings were obtained experimentally from a FET:

V_{GS}	-0.1 V	-0.1 V	-0.4 V
V_{DS}	5 V	14 V	14 V
I_D	8 mA	8.3 mA	7.1 mA

Determine

- (i) ac drain resistance
- (ii) transconductance and
- (iii) amplification factor. (8)

Q.5 a. Draw the circuit diagram of transformer-coupled class-B amplifier and explain its operation with the help of waveforms. (8)

b. What is a phototransistor? How does it differ from an ordinary transistor? Explain its construction and principle of working with a neat sketch. (8)

Q.6 a. What is an op-amp? Draw the block diagram of an op-amp and explain the function of each block. (8)

b. List out the ac characteristics of op-amp and discuss slew rate in detail. (8)

Q.7 a. Draw the circuit diagram of Sample and Hold circuit using op-amp and explain its operation with the help of input and output waveforms. (9)

b. In the circuit of non-inverting op-amp as shown in Fig. 1, if $R_1 = 5 \text{ k}\Omega$, $R_f = 20 \text{ k}\Omega$, $V_i = 1 \text{ V}$ and $R_L = 5 \text{ k}\Omega$, then calculate

- (i) Output voltage, V_O
- (ii) Closed loop gain, A_{CL}
- (iii) The load current i_L
- (iv) The output current ' i_O ' indicating proper direction of flow. (7)

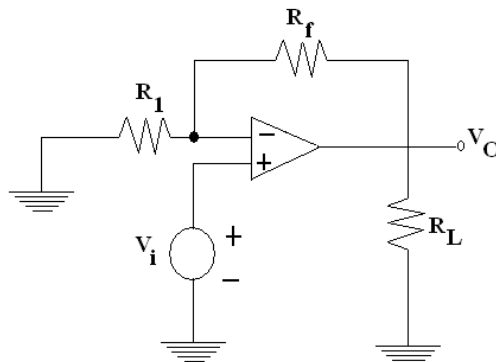


Fig. 1

Q.8 a. Draw the circuit diagram of triangular waveform generator using op-amp and describe its operation with waveforms. (8)

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- b. Describe the operation of monostable multivibrator using IC555, with the help of circuit diagram and waveforms (8)

Q.9 a. What is the function of a voltage regulator? Draw the functional block diagram of 723 general purpose regulator and explain its operation. What are its advantages over three terminal voltage regulators? (10)

- b. Determine the output voltages produced by a Digital to Analog (D/A) converter, whose output range is from 0 to 10 V and whose input binary number is

- (i) 10 (for a 2-bit D/A converter)
- (ii) 0110 (for 4-bit D/A converters)
- (iii) 10111100 (for a 8-bit D/A converters) (6)