

DiplETE – ET (NEW SCHEME) – Code: DE56**Subject: ANALOG ELECTRONICS**

Time: 3 Hours

Max. Marks: 100

DECEMBER 2011**NOTE: There are 9 Questions in all.**

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- 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. The output voltage of a CE amplifier with respect to its input voltage is

- (A) amplified (B) inverted
(C) 180° out of phase (D) all of the above

b. A transistor has $h_{fe}=27$ and its h_{fc} will be

- (A) -0.96 (B) 0.96.
(C) -0.27 (D) -0.28

c. A transistor switch will be biased to work in its _____ region of operation.

- (A) Cut-off and Active (B) Cut-off and Saturation
(C) Active and Saturation (D) None of the above

d. The drain to source current of an n- channel depletion MOSFET has

- (A) $I_{ds}=0$ at $V_{gs}=0$ (B) $I_{ds}=\text{negative maximum}$ at $V_{gs}=0$
(C) $I_{ds}=\text{positive maximum}$ at $V_{gs}=0$ (D) I_{ds} is independent of V_{gs}

e. Which of the following provides least distortion?

- (A) Class A (B) Class B
(C) Class AB (D) Class C

f. Due to capacitances within an op-amp, the gain of an op-amp _____ at higher frequencies

- (A) decreases (B) increases
(C) neither decreases or increases (D) infinity

- g. Op-amps can be used for amplifying
- (A) AC inputs only (B) DC inputs only
(C) both (A) & (B) (D) None of the above
- h. A Schmitt trigger uses
- (A) negative feedback
(B) positive feedback
(C) both positive and negative feedback
(D) no feedback
- i. An astable 555 timer has the following number of stable states
- (A) 0 (B) 1
(C) 2 (D) 3
- j. The ADC which completes n-bit conversion in n-clock periods is
- (A) Flash (B) dual-slope
(C) Successive approximation (D) servo tracking

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

- Q.2** a. List the basic process used in the silicon planar technology (4)
- b. Sketch the cross-sectional structure of (8)
(i) Multi-emitter transistor
(ii) Complementary MOSFET (CMOS)
- c. Describe the oxidation process in detail. (4)
- Q.3** a. Explain the need for coupling and bypass capacitors in transistor circuits (6)

- b. Sketch the h-parameter equivalent circuit of CE configuration and the parameters for transistor shown in Fig.1 are, $R_1=68 \text{ k}\Omega$, $R_2=56 \text{ k}\Omega$, $R_C=3.9 \text{ k}\Omega$, $R_E=4.7 \text{ k}\Omega$, $R_L=82 \text{ k}\Omega$ and $h_{ie}=2.1 \text{ k}\Omega$, $h_{fe}=75$, $h_{oe}=1 \mu\text{s}$ ($\mu \text{ mho}$ or $\mu \text{ Semen}$). Calculate
- (i) input impedance
(ii) output impedance
(iii) voltage gain

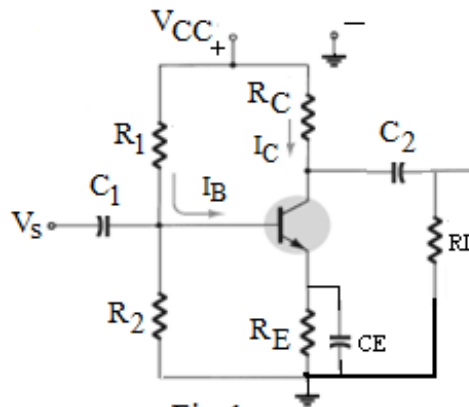
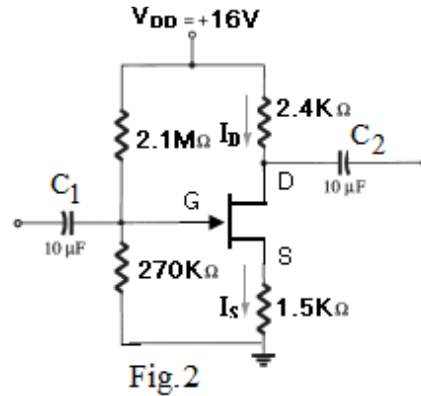


Fig.1

(10)

- Q.4** a. With the help of characteristics and cross-sectional diagram explain the operation of an n-type enhancement mode MOSFET (8)
- b. For the JFET circuit shown in Fig.2, find V_G , I_D , V_{GS} and V_{DS} , if $V_P = -4V$ and $V_{DD} = 16V$. (8)



- Q.5** a. Explain with circuit the operation of optocoupler. What are its applications?(8)
- b. The class-B power amplifier circuit dissipates 4W in the 16Ω load. If $V_{CC}=30V$ and transformer efficiency is 80% find
- (i) AC resistance offered by the transformer primary (r_L)
 - (ii) The voltage appears across the collector of Q_2 ($V_{CE\ max}$)
 - (iii) Peak transistor current (I_p)
 - (iv) Power dissipation in each transistor (P_T) (8)
- Q.6** a. Derive an expression for voltage gain of non inverting amplifier (5)
- b. Discuss briefly the following terms with respect to op-amp
- (i) Input bias current
 - (ii) Input off-set voltage
 - (iii) Slew rate
 - (iv) Power Supply Rejection Ratio (PSRR) (8)
- c. For a non-inverting op-amp with $R_1=1k\Omega$, $R_f = 10\ k\Omega$. Calculate maximum output offset voltage(V_{OT}) if $V_{ios}=10mv$ and $I_B=300nA$ (3)
- Q.7** a. List the important features of instrumentation amplifier (4)
- b. With the help of block diagram explain the operation of
- (i) Precision full wave rectifier
 - (ii) Sample and hold circuit (12)
- Q.8** a. Explain, with the help of waveforms and circuit diagram, the operation of a square wave generator using op-amp. (8)
- b. Explain the operation of monostable multivibrator using 555 timer and derive an expression of its time delay (8)
- Q.9** a. What are the advantages of R-2R ladder DAC, explain its operation with block diagram (8)
- b. With the help of block diagram and waveform explain the operation of Dual Slope type ADC. (8)