ROLL NO. _____

Code: DE56 **Subject: ANALOG ELECTRONICS**

DipIETE – ET

Time: 3 Hours **DECEMBER 2013** **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. Thin Film Resistor technology has advantage of

(A) lesser and smaller parasitic component
(B) that the value of resistors cannot be easily changed
(C) high temp coefficient
(D) none of these

b. In common collector configuration, there is

(A) high voltage gain **(B)** high current gain
(C) low input resistance **(D)** high output resistance

c. JFET has high input impedance because

(A) it is made up of semiconductor material
(B) input is reversed biased
(C) of impurity atoms
(D) none of these

d. Power amplifier generally use transformer coupling because transformer permits

(A) cooling of the circuit **(B)** impedance matching
(C) distortion less output **(D)** good frequency response

e. With Zero volts on both inputs an OPAMP ideally should have an output

(A) equal to positive supply voltage **(B)** equal to negative supply voltage
(C) equal to zero voltage **(D)** equal to infinite voltage

f. LM380 is

(A) hybrid power amplifier
(B) audio power amplifier
(C) operational transconductance amplifier
(D) none of these

g. For integrating circuit to be effective, the RC product should be ____ the time period of the input wave

(A) 5 times greater than **(B)** 5 times smaller than
(C) equal to **(D)** at least 10 times greater than

h. 555 timer in monostable operation can be used as

(A) AM Modulator **(B)** Square wave generator
(C) Missing pulse detector **(D)** Schmitt trigger

i.

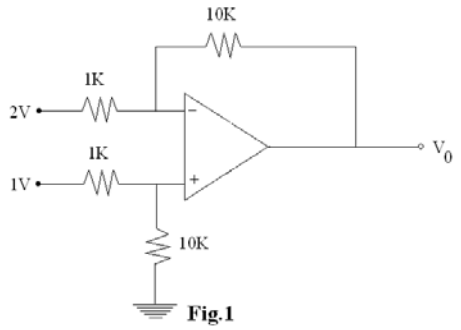

Fig.1

In the above circuit, the o/p voltage V_0 is

(A) 10V **(B)** -10V
(C) 8V **(D)** -8V

j. Typical value of line regulation from data sheet of 7805 is

(A) 15 mV **(B)** 10 mV
(C) 5 mV **(D)** 3 mV

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

Q.2 a. How integrated resistors are fabricated? Explain diffused resistor method in detail? **(8)**

b. Why aluminium is usually used for metallization of most ICs? **(4)**

c. Explain the self aligning property of a polysilicon gate MOSFET **(4)**

Q.3 a. Explain the need for coupling and bypass capacitors in transistor circuits, and draw AC Equivalent circuit of CE amplifier. **(8)**

b. Use the simplified h-parameter model to derive equations for the current gain A_i, the input impedance R_{in}, the gain A_v and the output impedance R_{out} for the emitter follower circuit shown in Fig.2. Calculate the value of these parameters, assuming h_{ie}= 1100Ω , R_e = 10 KΩ , h_{fe} = 50 and R_s = 1kΩ **(8)**

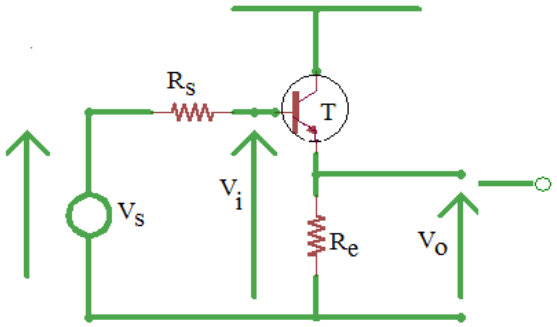

Fig.2

Q.4 a. Draw and explain the transfer characteristics of JFET. List the advantages of JFET. **(8)**

b. The constant current circuit shown in Fig.3 uses a JFET whose operation is described by the equation **(8)**

$I_D = I_{DSS}(1-V_{GS}/V_P)^2$, I_{DSS} = 8 mA and V_p = 4 V

(i) Draw the equivalent circuit as an amplifier

(ii) Calculate the required value of R to give a current of 0.5 mA

(iii) If the FET drain- source resistance r_{ds} is equal to 50 KΩ at I_D =0.5 mA, determine the incremental resistance of the circuit for the value of R calculated in (ii)

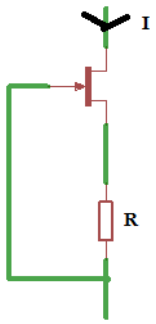

Fig.3

Q.5 a. Draw and explain the circuit of complementary emitter follower. **(5)**

b. Draw the circuits of opto-coupler with SCR and Triac and briefly explain these circuits. **(5)**

c. Show that maximum collector efficiency of class A transformer coupled power amplifier is 50%. **(6)**

Q.6 a. What is the need of negative feedback in OPAMP? **(4)**

b. Define the following parameter and give their values for IC 723 **(4)**
(i) Input bias current (ii) CMMR
(iii) Output resistance (iv) Input offset voltage

c. For the differentiator circuit shown in Fig.4, find:
(i) the expression for the output voltage
(ii) the output voltage for the given input. **(8)**

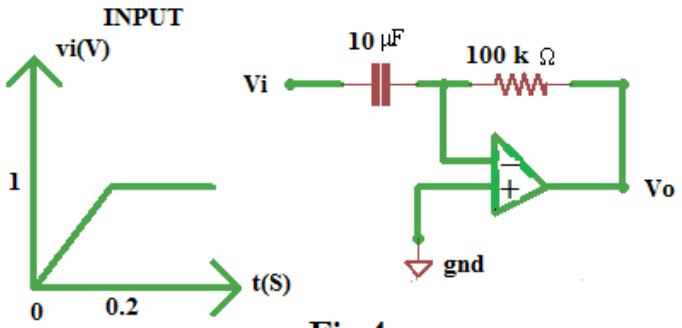

Fig.4

Q.7 a. Draw and explain Sample and Hold circuit using OPAMP. Draw input and output waveform of the circuit. **(8)**

b. For the circuit shown in the Fig.5 assuming that the input current is negligible, show that $v_o/v_i = f(R_2, R_1, A)$ and that it may be approximately to $v_o/v_i = -(R_2/R_1)$. Explain the purpose of R_3 **(8)**

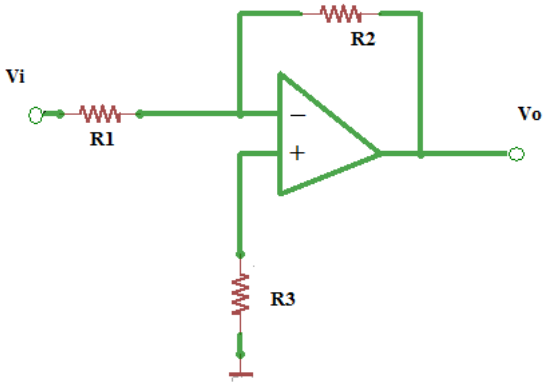

Fig.5

Q.8 a. What are the applications of comparators? Explain the operation of zero crossing detector. **(8)**

b. Draw the circuit of a Astable Multivibrator using 555 timer and explain its operation. **(8)**

Q.9 Write Short notes on any **TWO** of the following: **(2×8)**
(i) 723 general purpose voltage regulator
(ii) Flash type A/D convertor
(iii) IC voltage regulator