Code: DE56/DE106   **Subject: ANALOG ELECTRONICS**

DipIETE – ET (Current & New Scheme)

Time: 3 Hours   **JUNE 2016**   **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.**
- **Q2 TO Q8 CAN BE ATTEMPTED BY BOTH CURRENT AND NEW SCHEME STUDENTS.**
- **Q9 HAS BEEN GIVEN INTERNAL OPTIONS FOR CURRENT SCHEME (CODE DE56) AND NEW SCHEME (CODE DE106) STUDENTS.**
- **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.   First layer in an IC is made up of _____.
   (A) P-type silicon substrate   **(B)** n-type material
   (C) Thin SiO_2 layer   **(D)** An aluminium layer

b. The conversion formula for h_{ib} from CE h-parameters to CB h-parameters for h_{ib} is _____.

   (A) $h_{ib} \approx \dfrac{hie}{1+hoe}$ **(B)** $h_{ib} \approx \dfrac{hie}{1+hfe}$

   (C) $h_{ib} \approx \dfrac{hie}{1-hfe}$ **(D)** $h_{ib} \approx \dfrac{hie}{1-hoe}$

c. The region of I_D/V_{DS} characteristics are called Pinch off region where _____.
   (A) I_D increases   **(B)** I_D & V_{DS} are both constant
   (C) I_D is constant   **(D)** V_{DS} constant

d. Light intensity in an LED at a distance of 2m from a 10mcd source is _____.
   (A) 2.5 mlx   **(B)** 5.2 mls
   (C) 3.4 mlx   **(D)** 4.3 mlx

e. How many basic terminals (input, output and supply terminals) are available in an op-amp?
   (A) 3   **(B)** 4
   (C) 5   **(D)** 6

f. One of the following is not a feature of an instrumentation amplifier.
   (A) High gain **(B)** High CMRR
   (C) Low dc offset **(D)** High Output impedance

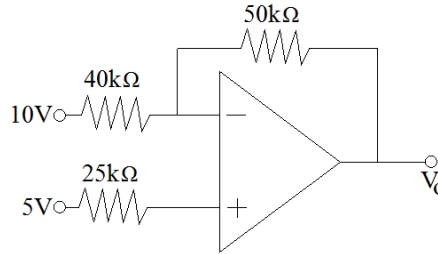g. Find V_O for the adder-subtractor circuit shown in Fig.1?

Fig.1

   (A) 22.5 V **(B)** –22.5 V
   (C) 12.5 V **(D)** –12.5 V

h. An audio amplifier operates in the frequency range of _____.
   (A) 0 Hz to 20 Hz **(B)** 20 Hz to 20 kHz
   (C) 20 kHz to 200 kHz **(D)** Above 200 kHz

i. Photo diode is used for the detection of _____.
   (A) Visible light **(B)** Invisible light
   (C) No light **(D)** Both **(A)** and (B)

j. Which one of the following Process is not used in the preparation of silicon wafers?
   (A) Crystal growth and doping **(B)** Ingot slicing
   (C) Ingot trimming and grinding **(D)** Metallization

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

Q.2 a. Classify the integrated circuits according to digital ICs and analog ICs. **(4)**

b. Explain the fabrication of complementary MOSFET with the help of neat diagrams. **(8)**

c. Explain briefly the two types of plating techniques. **(4)**

Q.3. a. Draw and analyze the circuit for transistor common base amplifier with voltage and current waveforms. Also mention equations for input impedance, output impedance, and voltage gain. **(12)**

b. Give the comparison among CE, CC & CB circuits in terms of Z_i, Z_o, A_v, phase shift. **(4)**

Q.4.　a. Explain the operation of an N-channel JFET with the help of circuit diagram. Indicate voltages and current directions.　**(8)**

　　　b. Draw and explain the operation of N-channel depletion enhancement MOSFET.　**(8)**

Q.5.　a. Explain the design aspects of transformer coupled amplifier.　**(12)**

　　　b. List the applications of optocouplers and phototransistors.　**(4)**

Q.6.　a. Explain input bias current of an op-amp and derive an expression for compensating resistor (R_{comp}).　**(10)**

　　　b. In the given op-amp circuit shown in Fig. 2 calculate:　**(6)**
　　　　(i) I_i　　　　　　　　(ii) V_o
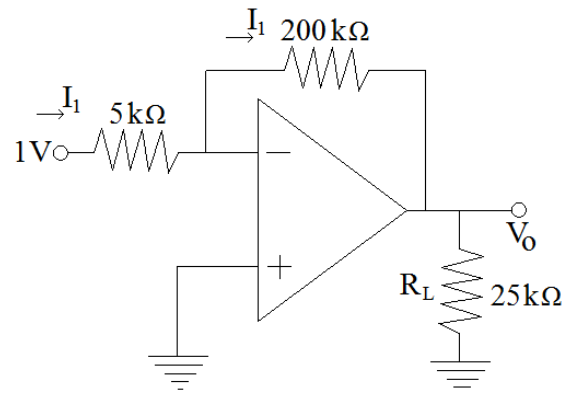　　　　(iii) I_L　　　　　　　(iv) total current I_o when load of 25 kΩ is connected

Fig.2

Q.7　a. Draw the circuit of inverting summing amplifier for 2 inputs using op-amp and drive an expression for its output voltage.　**(8)**

　　　b. Draw the circuit of half wave rectifier using op-amp and diode. Explain its operation.　**(8)**

Q.8　a. Explain the operation of triangular wave generator with the help of circuit diagram and output waveform.　**(8)**

　　　b. Draw the circuit of missing pulse detector using IC555 timer and explain its operation with the help of output waveforms.　**(8)**

Q.9　**(For Current Scheme students i.e. DE56)**

　　　a. Explain the functional block diagram of 723 regulator.　**(8)**

　　　b. Explain R-2R ladder DAC with the help of neat diagrams.　**(8)**

Q.9　**(For New Scheme students i.e. DE106)**

　　　a. Explain the counter-type A/D converter with the help of suitable diagram and waveform.　**(8)**

　　　b. Explain current limit protection regulator circuit.　**(8)**