

**DiplETE – ET**

Time: 3 Hours

**JUNE 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. The most commonly used transistor circuit configuration for power amplification is

- (A) CB (B) CC  
(C) CE (D) CE, CB and CC

b. In a CE amplifier, if the emitter bypass capacitor is removed

- (A) Input resistance decreases (B) Output resistance increases  
(C) Voltage gain decreases (D) Current gain increases

c. Which of the following amplifiers provides maximum efficiency

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

d. Which of the following is used for isolation in circuits

- (A) LED (B) Optocoupler  
(C) Photo diode (D) Photo transistor

e. The slew rate of 741 C Op-Amp is

- (A) 1 V/  $\mu$ s (B) 0.5 V/  $\mu$ s  
(C) 10 V/  $\mu$ s (D) 40 V/  $\mu$ s

f. The circuit shown in the Fig.1 below is

- (A) Clipper (B) Half-wave rectifier  
(C) Peak detector (D) Sample & Hold circuit

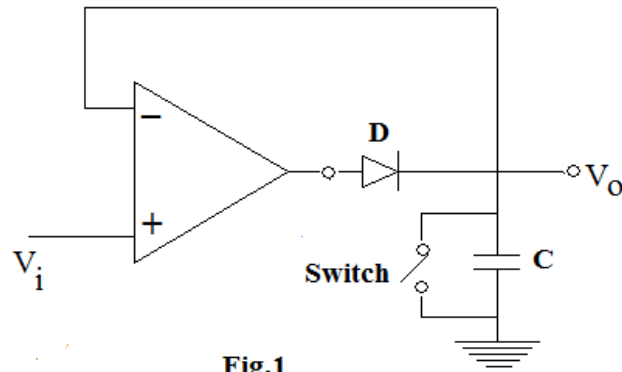


Fig.1

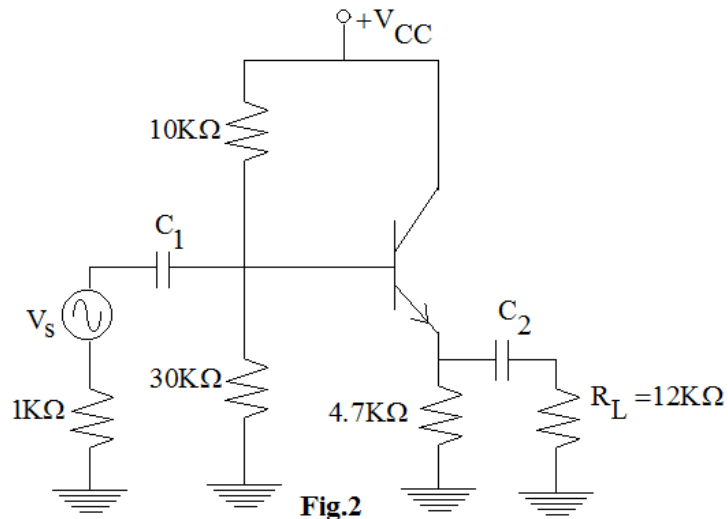
- g. The circuit used to convert a slowly varying input voltage into a square wave is
- (A) Schmitt trigger                      (B) Comparator  
(C) Monostable Multivibrator        (D) Astable Multivibrator
- h. The number of comparators required for a 4-bit parallel A to D converter
- (A) 3    (B) 7  
(C) 15    (D) 19
- i. For an FET  $I_{DSS} = 10$  mA,  $V_p = -4$ V, then the drain current  $I_D$  for  $V_{GS} = -2$ V is
- (A) 2 mA    (B) 2.5 mA  
(C) 6 mA    (D) 5 mA
- j. In a 3-terminal fixed voltage regulators the unregulated input voltage should be more than the regulated output voltage by at least
- (A) 0.1 V    (B) 0.5 V  
(C) 1 V    (D) 2 V

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

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- Q.2** a. Explain
- (i) Diffusion
- (ii) Ion implantation used in IC fabrication    (8)
- b. Explain how a complementary MOSFET (CMOS) is fabricated on an IC. (8)
- Q.3** a. The transistor in the CC circuit in Fig.2 has the following parameter  $h_{ie} = 2.1\text{K}\Omega$  and  $h_{fe} = 75$ .
- (i) Calculate the  $Z_{in}$ ,  $Z_{out}$  with  $R_L$  not connected.
- (ii)  $Z_{in}$  and  $A_V$  with  $R_L$  connected.    (8)



b. Compare the performance of CE, CC, and CB circuits. (8)

**Q.4** a. Explain the drain characteristics of n-channel JFET with  $V_{GS} = 0$  V. (8)

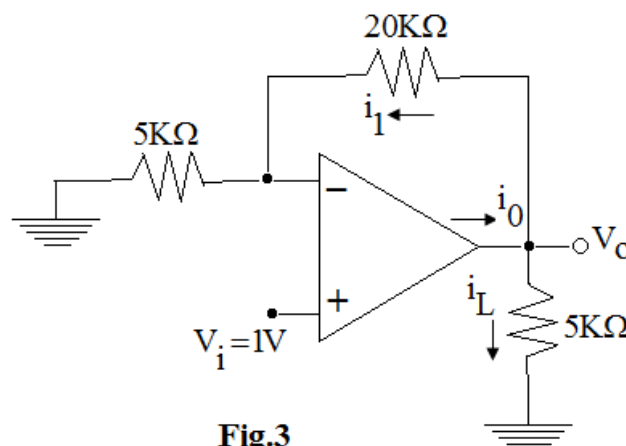
b. Explain the terms  
 (i) Transconductance  
 (ii) Drain Resistance  
 (iii) Breakdown Voltage with respect to JFET (8)

**Q.5** a. Explain, with a neat diagram, the working of a Class A transformer coupled power amplifier. (8)

b. Write a short note on LED and optocoupler. (8)

**Q.6** a. Derive an expression for the gain of Non-Inverting Amplifier using op-amp. (8)

b. For the circuit shown in Fig.3 below, calculate  
 (i)  $V_0$  (ii)  $A_{CL}$   
 (iii) the load current  $i_L$  (iv) total current  $i_o$  (8)



- Q.7** a. Draw the circuit of Inverting summing amplifier using an op-amp and derive the expression for its output voltage. (8)
- b. Explain the working of the following circuits using op-amp.  
(i) Peak Detector (ii) Clipper (8)
- Q.8** a. Explain the working of a Schmitt Trigger using an op-amp, with waveforms. (8)
- b. Explain the working of 555 timer as monostable multivibrator. Also derive the expression of frequency of oscillation. (8)
- Q.9** a. Explain how a fixed voltage regulator can be used as a  
(i) Current Source (ii) Adjustable Regulator (8)
- b. Explain the working of Counter type A/D Converter. (8)