

Seat No.	
-------------	--

[5057]-243

**S.E. (E&TC/Electronics) (First Semester) EXAMINATION, 2016  
ELECTRONIC DEVICES AND CIRCUITS  
(2012 PATTERN)**

**Time : Two Hours**

**Maximum Marks : 50**

- N.B. :-**
- (i) Attempt Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.
  - (ii) Neat diagrams must be drawn wherever necessary.
  - (iii) Figures to the right indicate full marks.
  - (iv) Use of calculator is allowed.
  - (v) Assume suitable data, if necessary.

1. (a) Define Bias Compensation. Draw and explain circuit of Diode Compensation against change in  $I_{CO}$ . [6]
- (b) Calculate the values of  $A_V$ ,  $A_{VS}$ ,  $R_i$ ,  $R_i'$ ,  $R_o'$  for BJT CE amplifier as shown in Fig. 1. [6]
- The h-parameter values are  $h_{ie} = 1.1 \text{ k}\Omega$ ,  $h_{fe} = 50$ ,  $h_{re} = 2.5 \times 10^{-4}$ ,  $h_{oe} = 25 \text{ A}\mu\text{V}$ .

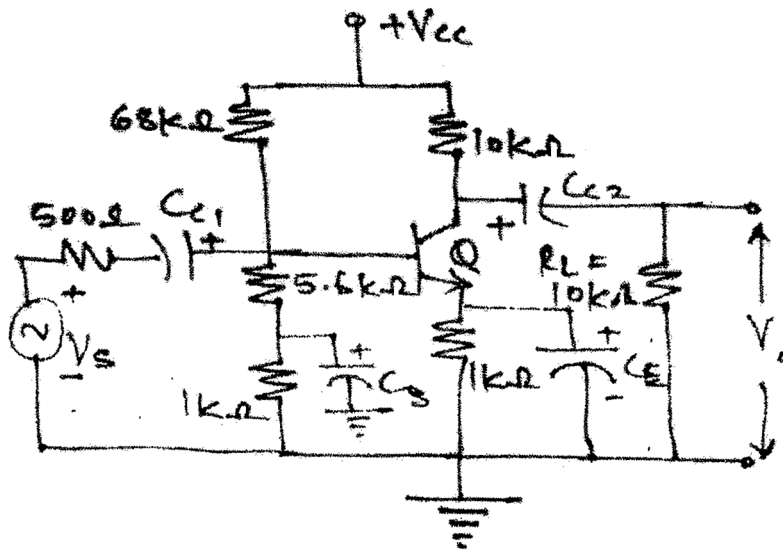


Fig. 1

P.T.O.

*Or*

2. (a) A Ge transistor is used in voltage divider bias circuit has  $V_{CE} = 8 \text{ V}$ ,  $I_C = 4 \text{ mA}$ ,  $\beta = 50$ ,  $V_{CC} = 16 \text{ V}$ ,  $R_C = 1.5 \text{ } \Omega$ . If  $S = 12$  is desired, then calculate values of  $R_1$ ,  $R_2$  and  $R_E$ . [6]
- (b) Give comparison of CE, CB and CC amplifiers performance parameters. [6]
3. (a) Define and derive the expression for  $f_{\alpha}$ ,  $f_{\beta}$  and  $f_T$ . [6]
- (b) Draw and explain circuit diagram of transistorized Colpitt's oscillator. Calculate the frequency of oscillations of a Colpitt's oscillator with  $C_1 = C_2 = 500 \text{ pF}$  and  $L = 1 \text{ mH}$ . [6]

*Or*

4. (a) The following measurements were taken while testing an amplifier using square wave input waveform : [6]
- (i) For square wave input frequency of 5 kHz the rise time of output waveform is 20  $\mu\text{sec}$ ,
- (ii) For square wave input frequency of 100 Hz, there is sag of 1 V in 2.5 V amplitude observed on CRO.

Determine the bandwidth of an amplifier under test.

(b) Mention the effect of negative feedback on amplifiers performance such as : [6]

- (i) Gain
- (ii) lower cut-off frequency
- (iii) upper cut-off frequency
- (iv) Noise,
- (v) Non-linear distortion
- (vi) Frequency distortion.

5. (a) The dynamic transfer characteristic curve of transistor is :

$$i_c(\text{mA}) = 50 i_b + 1000 i_b^2.$$

Where  $i_b$  (mA) =  $10 \cos 2\pi (100 t)$ .

Calculate the percentage second harmonic distortion. [6]

(b) Prove that the maximum possible efficiency of a Class B amplifier is 78.5%. [7]

*Or*

6. (a) Explain the following parameters of Power BJT : [6]

- (i) Thermal Resistance
- (ii) Safe Operating Area.

(b) For a Class B power amplifier providing a 22 V peak signal to 8  $\Omega$  load and power supply of 25 V. Determine : [7]

(i)  $P_{dc}$

(ii)  $P_{ac}$

(iii) %  $\eta$ .

7. (a) Write a short note on : Bi-CMOS Inverter. [6]

(b) For the transistor shown in Fig. 2 has the parameter  $V_T = 0.8$  V,  $k = 0.5$  mA/V<sup>2</sup>. Determine the values of  $V_{DS}$  and  $I_D$ . [7]

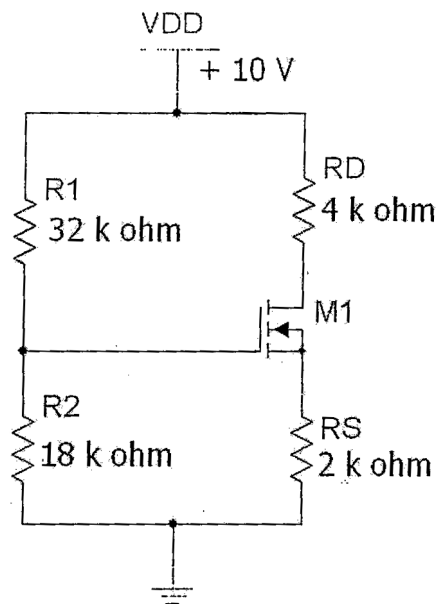


Fig. 2

*Or*

8. (a) The parameters of NMOSFET are  $k = 0.2 \text{ mA/V}^2$ ,  $\lambda = 0.01 \text{ V}^{-1}$ ,  $V_T = 1.2 \text{ V}$ . Calculate output resistance for : [6]

(i)  $V_{GS} = 2 \text{ V}$ ,

(ii)  $V_{GS} = 4 \text{ V}$ .

(b) Explain the following non-ideal current voltage characteristics of EMOSFET : [7]

(i) Finite output resistance

(ii) Channel Length Modulation

(iii) Body Effect.