

Reg. No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code: **EC205**Course Name: **ELECTRONIC CIRCUITS (AE, EC)**

Max. Marks: 100

Duration: 3 Hours

**PART A*****Question is 1 COMPULSORY and Answer EITHER Question 2 OR Question 3******Each Full Question Carries 15 marks.***

1. a) Define the THREE stability factors of Common Emitter amplifier and derive expression for the Current stability factor of a potential divider bias CE amplifier circuit. (8)
- b) A Common Base amplifier is driven by a voltage source of internal resistance  $60\Omega$ . The load resistance is  $20K\Omega$ . The transistor has  $h_{ib} = 22\Omega$ ,  $h_{rb} = 0.0003$ ,  $h_{fb} = -0.98$  and  $h_{ob} = 0.5\mu A/V$ . Compute the current gain  $A_I$ , input resistance  $R_i$ , voltage gain  $A_V$ , overall voltage gain  $A_{V_s}$ , overall current gain  $A_{I_s}$  (considering the source resistance also), and operating power gain  $A_P$ . (7)
2. a) An ideal  $1\mu S$  pulse from a pulse generator is fed to an amplifier. Calculate and plot the output waveform with a rise time of the capacitor  $2.2 RC$ . The upper 3dB frequency is 0.1 MHz. (7)
- b) How amplifiers are classified based on their Q-points? Explain showing the positions of the Q-points on the respective load lines and current transfer characteristic curves for at least THREE types of classes. Also compare their merits and demerits. (8)
3. a) Define the small signal hybrid parameters of a Common Emitter configuration. Show how to determine their values from the characteristics. (8)
- b) Draw the circuit of a two-stage RC coupled amplifier. Derive expressions for its effective lower cut-off frequency and effective upper cut-off frequency. If the individual stages are having  $f_L = 20 Hz$  and  $f_H = 200 kHz$ , calculate the respective values for the cascaded two-stage. (7)

**PART B*****Question 4 is COMPULSORY and Answer EITHER Question 5 OR Question 6******Each Full Question Carries 15 marks.***

4. a) What are the physical origins of resistances in the high frequency hybrid  $\pi$  model of a CE transistor amplifier? Explain the different parameters in the hybrid  $\pi$  circuit. (7)

- b) Make a distinction between “voltage” feedback and “current” feedback in amplifier circuits. Discuss the merits in each case and derive expressions for the net output resistance in each case. (8)
5. a) Sketch the topology for the generalized resonant circuit oscillator, using impedances  $z_1$ ,  $z_2$  and  $z_3$ . Derive the expression for the frequency of oscillation. Under what conditions does the configuration reduce to Colpitts oscillator? (10)
- b) Derive the equation which shows that the sensitivity of an amplifier reduces by applying negative feedback to the circuit. (5)
6. a) Deduce the high frequency equivalent circuit of a potential divider bias CE amplifier circuit. Derive the expression for the CE short circuit current gain as a function of frequency. Explain with frequency response characteristics diagram, the relationship between  $f_\beta$  and  $f_T$ . (12)
- b) Draw the circuit of a cascode amplifier and explain its properties. (3)

## PART C

**Question is 7 COMPULSORY and Answer EITHER Question 8 OR Question 9**

**Each Full Question Carries 20 marks.**

7. a) With neat circuit diagram and necessary waveforms, explain how a transistorized astable multivibrator is working as a free running oscillator. Derive the expression for the frequency. Show in the circuit diagram, how you can eliminate the rounding of the collector waveform and make the edges sharp? (12)
- b) An N-channel E-MOSFET used in a potential divider bias CS amplifier has  $I_{D(ON)} = 4\text{mA}$  at  $V_{GS(ON)} = 8\text{V}$ ,  $V_{GST} = 4\text{V}$ ,  $g_m = 2\text{ mS}$ . Calculate values of (i)  $V_{GS}$ , (ii)  $V_{DS}$ , (iii)  $I_D$  and (iv) output Voltage, if  $R_1 = 60\text{k}\Omega$ ,  $R_2 = 40\text{k}\Omega$ ,  $R_D = 6\text{k}\Omega$ ,  $V_{DD} = 15\text{V}$  and the ac input signal =  $80\text{mV}$ . (8)
8. a) Using fictitious generator block diagram, show how a Bootstrap generator can produce linear sweep voltage by constant current charging. Draw a transistorized circuit and waveforms to explain the Bootstrap action to generate linear sweep. (12)
- b) A Class B push-pull power amplifier is supplied with  $V_{CC} = 50\text{V}$ . The signal swings the collector voltage down to  $V_{\min} = 5\text{V}$ . The total dissipation in both transistors is  $40\text{W}$ . Calculate the total output power and conversion efficiency. (8)
9. a) Draw the circuit of a series pass voltage regulator which uses a feedback. Explain its working when the input voltage as well as load current varies. Design your circuit to deliver  $6\text{V}$ ,  $100\text{mA}$  maximum load current. (12)
- b) Draw the circuit of a Drain feedback bias circuit for E-MOSFET. Explain its working and properties. (8)