

( 3 Hours )

(Total Marks: 80

- N.B. :** 1. Question **ONE** is **compulsory**.  
 2. Solve any **THREE** out of remaining questions.  
 3. **Draw** neat and **clean diagrams**.  
 4. Assume suitable **data** if **required**.

- Q. 1. A. What is the source of the leakage current in a transistor?

If the emitter current of a transistor is 8 mA and  $I_B$  is 1/100 of  $I_C$ , determine the levels of  $I_C$  and  $I_B$ . 5

- B. Explain the concept of virtual ground in operational amplifiers. 5

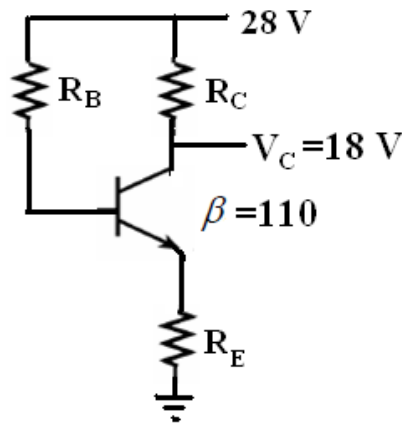
- C. Draw the spectrum of amplitude modulated wave and explain its components. 5

- D. Explain adaptive delta modulation. 5

- Q. 2 A. The emitter bias configuration as shown in following figure has the specifications:

$$I_{CQ} = \frac{1}{2} I_{Csat} \quad I_{Csat} = 8 \text{ mA} \quad V_C = 18 \text{ V} \quad \text{and} \quad \beta = 110$$

Determine  $R_C$ ,  $R_E$  and  $R_B$ . 10



- B. Explain the following parameters and their values for 741 opamp

CMRR, Slew Rate, Gain Bandwidth Product, Input Offset Voltage and

Output Resistance. 10

Q. 3 A. Given  $\beta=120$  and  $I_E= 3.2 \text{ mA}$  for a common-emitter configuration with  $r_0=\infty \Omega$ , determine:

(a)  $Z_i$

(b)  $A_v$  if a load of  $2 \text{ k}\Omega$  is applied.

(c)  $A_i$  with the  $2 \text{ k}\Omega$  load.

5

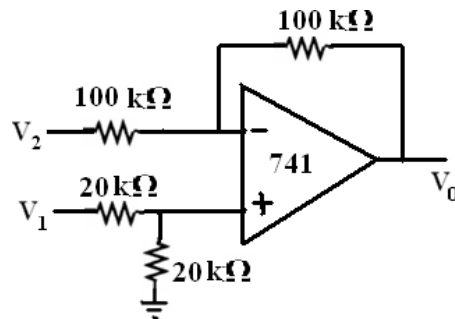
B. State and explain Barkhausens criteria for oscillations.

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C. Explain principle of TDM.

5

D. Determine the output voltage for the circuit if  $V_1=5\text{V}$  and  $V_2=3\text{V}$



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Q. 4 A. Draw the block diagram of phase cancellation SSB generation and explain how the carrier and unwanted sidebands are suppressed .

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B. Draw the PAM, PPM and PWM waveforms in time domain assuming a sinusoidal modulating signal. Explain them in brief.

10

Q. 5 A. State Shannon's theorem on channel capacity.

What is the maximum capacity of a perfectly noiseless channel whose bandwidth is  $120 \text{ Hz}$ , in which the values of the data transmitted may be indicated by any one of the  $10$  different amplitudes?

10

B. With respect to neat diagram explain the elements of analog communication system.

10

Q. 6 A. What is Nyquist Criteria? What is its significance?

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B. Give the proper definition for entropy and information rate.

5

C. Write short note on op-amp as comparator.

5

D. Differentiate between Class A and Class C power amplifiers with respect to circuit diagram, operating cycle and power efficiency.

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