(13)

COLLEGE OF ENGINEERING, ANNA UNIVERSITY

Degree : B.E **Regulations : R 2004**
Branch : Electronics and Communication Engg. **Semester : III**
Subject Code No. / Subject Title : EC272 – Electronic Circuits – I
Time: 3 Hours **Max.marks: 100**
Answer ALL questions **PART-A** **(10X2=20 marks)**

1. Draw the small signal equivalent circuit of CE amplifier.
2. What is the noise margin of CMOS inverter?
3. Draw the small signal model of MOS device.
4. Draw the circuit of common source amplifier with diode connected n-EMOS load.
5. Draw the high frequency equivalent circuit of FET.
6. What are the limitations of high frequency CC amplifier?
7. What is total harmonic distortion in output stage of an amplifier?
8. Compare power BJT and MOSFET
9. Find the TUF and PIV of a full wave bridge rectifier.
10. Draw the V-I characteristic curve of a SCR.

PART-B **(5X16=80 marks)**

11. a. i. Derive f_α, f_β and f_T of BJT and relate them. **(10)**
    ii. Derive the high frequency model of FET. **(6)**

12. a. i. Derive for gain, input and output resistance of common base amplifier using its equivalent circuit.
    ii. Explain the operation of CMOS inverter circuit

    (or)

    b. i. Describe the configuration of cascode amplifier and derive its important parameters.
    ii. Derive for A_d of differential amplifier from its equivalent circuit.

13. a. Explain biasing of MOS using Voltage divider bias and design a circuit to operate at a dc drain current of 0.5mA. Assume following values $V_t = 1V$, $k_n'W/L = 1mA/V^2$, $V_{DD} = 15V$

    (or)

    b. Find the voltage gain, input and output resistance of CMOS common drain amplifier.

14. a. Explain the operation of class A transformer coupled amplifier and derive the power conversion efficiency.

    (or)

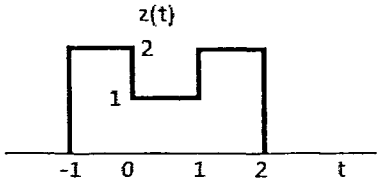
    b. i. Describe the characteristics of power BJT comparing with the small signal BJT.
    ii. Write short notes on heat sinks.

15. a. i Explain LC filter circuit used with rectifiers.
    ii A full-wave rectifier dc power supply is to provide 20V to a 500Ω load. The peal-to-peak ripple voltage is not to exceed 10% of the average output voltage, and the ac input frequency is 50Hz. Calculate the capacitor value required for the filter

    (or)

    b. With neat diagram explain the operation SMPS.

(c) Compute the energy of the signal $z(t)$ shown below. (2)



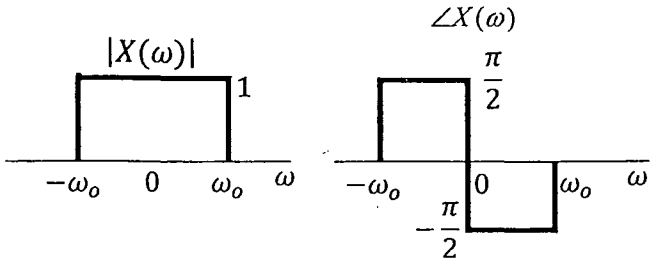
(d) (i) Check if the system $y(t) = 3x^2(t)$ is linear. (2)

(ii) Check if the system $y(t) = te^{3t}$ is time invariant. (2)

(iii) Check if the system $y[n] = \frac{x[n]}{x[n+1]}$ is causal. (2)

2 (a) (i) State and prove scaling property of Fourier Transform. (8)

(ii) Using the plots of $|X(\omega)|$ and $\angle X(\omega)$, find $x(t)$. (8)



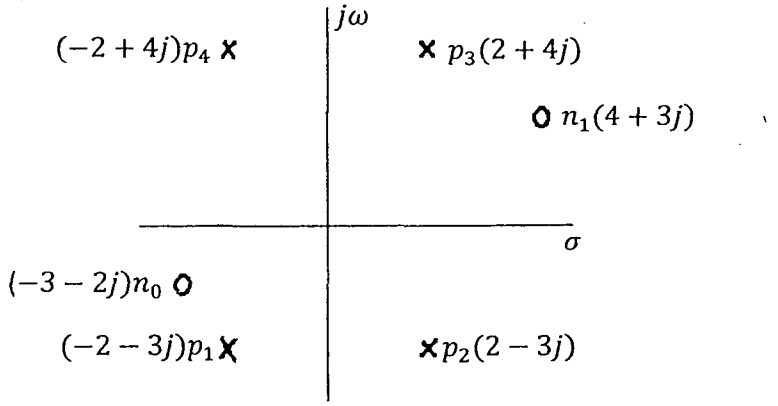
OR

12 (b)(i) What is the relation between Fourier Transform and Laplace Transform? (2)

(ii) Discuss about the properties of RoC of Laplace Transform. (4)

(iii) Find the Laplace Transform of $x(t) = e^{-4t}u(t) + e^{-5t}\sin(5t)u(t)$. (7)

(iv) For the pole-zero plot of $X(s)$ shown in the figure, draw the RoC for $X(s)$ if $x(t)$ is absolutely integrable. (3)
(p_j –poles, n_j- zeroes)



3. (a) Consider a causal LTI system described by $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 5x(t)$. Then, find

(i) Transfer function H(s) of the system and draw pole-zero plot with RoC (5)

(ii) Impulse response of the system (5)

(iii) Output of the system for the input $x(t) = e^{-2t}u(t)$ (6)

OR

3. b) Consider a causal LTI system with $H(\omega) = \frac{1}{j\omega+3}$.

(i) Find the input x(t) for the system produced output $y(t)=e^{-3t}u(t)-e^{-4t}u(t)$. (8)

(ii) Draw the magnitude response $|H(\omega)|$ of the system (4)

(iii) Find the output y(t) for the input x(t)=cos(t) (4)

4.(a) (i) Find the DTFT for $x_1[n]=(1/2)^{|n|}$ and use the result of $x_1[n]$ to find the DTFT of $x_2[n]=(n-1)(1/2)^{|n|}$. (8)

(ii) Find the inverse DTFT of $X(e^{j\omega}) = \begin{cases} 2j, & 0 < \omega \leq \pi \\ -2j, & \pi < \omega \leq 2\pi \end{cases}$ (8)