Department of Computer Systems Engineering
University of Engineering & Technology
Peshawar, PAKISTAN

Subject: Signal and Systems (4th Semester)

Exam: Final Term (Spring 2018)

Max Marks: 25, Time allowed: 2 hours

Question 1:

1) For the continuous-time periodic signal x(t) given bellow; (CLO 3) **(4 Marks)**

$$x(t) = 3 + \cos\left(\frac{\pi}{6}t + \frac{\pi}{6}\right) + 2\sin\left(\frac{\pi}{2}t + \frac{\pi}{2}\right) + 2\sin\left(\frac{2\pi}{3}t + \frac{\pi}{4}\right)$$

Find the fundamental frequency ω_0 and Fourier series confidents a_k, also draw the spectrum of the signal x(t).

2) Find the output y(t) when the signal x(t) given in part (1) above is passed through an LTI system with impulse response h(t) given bellow. (CLO 4) **(3 Marks)**

$$h(t) = e^{-2t}u(t)$$

Question 2:

1) Find the Fourier series coefficients of the periodic discrete-time signal x[n] shown in Figure 1. Also draw its magnitude and phase spectrum. (CLO 3) **(2+2 Marks)**

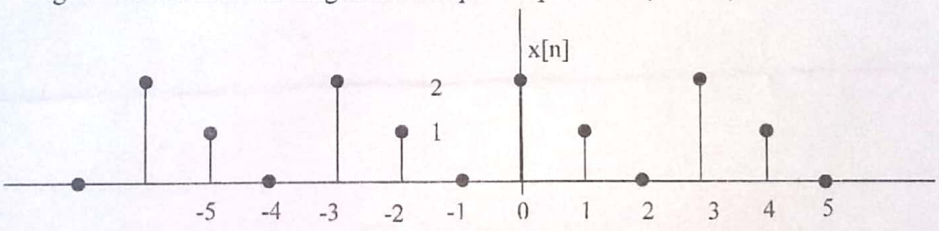

Figure 1

2) If the Fourier Series coefficients of a discrete-time periodic signal x[n] are denoted by a_k, find the coefficients for the signal $x_1[n]$ given bellow in terms of a_k.

$$x_1[n] = x[n] - x[n-1]$$

Using the above concept find the spectrum of signal $x_2[n] = x[n-1]$. Draw the magnitude and phase spectrum of $x_2[n]$ and compare it with spectrum obtained in part(a) above. (CLO 3) **(2+1+1+1 Marks)**

Question 3:

1) Use Fourier transform to find the convolution of x(t) and h(t) given bellow. (CLO 4) **(3)**

$$x(t) = e^{-2t}u(t)$$
$$h(t) = e^{-3t}u(t)$$

2) Use Fourier Transform method to find the impulse response of the LTI system given by the following difference equation. (CLO4) **(3+3 Marks)**

$$y[n] + \frac{1}{2}y[n-1] = x[n]$$

Also find the response of this system to the input signal x[n] given bellow;

$$x[n] = \left(\frac{1}{4}\right)^n u[n]$$

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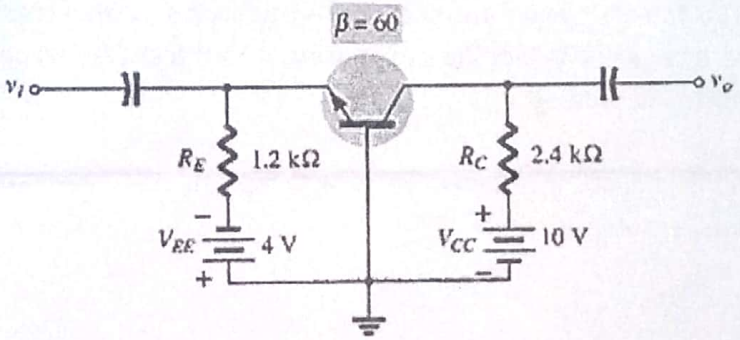
Electronic Circuits
Semester 4
Spring 2018 Final Exam

Q1 (Marks: 7+8)

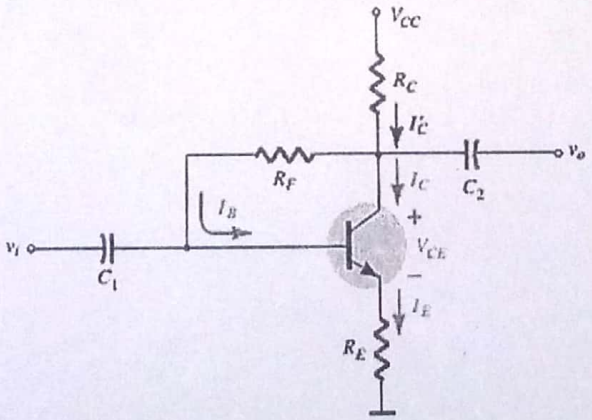
a) Draw the connection diagram of a **common emitter (CE)** PNP transistor configuration showing the transistor symbol, biasing voltage sources and current flow directions.

b) Draw the input and output voltage-current characteristic curves for a **common base(CB)** BJT configuration using proper subscripts for V and I. Tag the different regions in the graph.

Q2 Determine the currents I_E and I_B and the voltages V_{CE} and V_{CB} for the common-base configuration of the following figure. (Marks:15)



Q3 For the Collector Feedback configuration of the following figure, derive an expression for current I_B. (Marks:10)



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Q4 (Marks:10+10)

a) Draw the AC-equivalent circuit for a Common Emitter (CE), Emitter-biased configuration (unbypassed) using r_e transistor model.

b) Derive expressions for the input impedance Z_i, output impedance Z_o and voltage gain A_v for the above stated network.

Q5 Draw the symbols for the following devices: (Marks: 2+2+2+2+2)

a) PNP transistor

b) P-channel JFET

c) N-channel Depletion type MOSFET

d) P-channel Enhancement type MOSFET

e) N-channel Enhancement type MOSFET

Q6 Draw the drain and transfer characteristic curves for an n-channel JFET with I_{DSS} = 12 mA and V_P = -6 V. Plot the curves using at least four (V_{GS}, I_D) points derived with shorthand method. (Marks:15)

Q7 Design a digital inverter circuit using Complementary MOSFETS and show how it satisfies the truth table. (Marks: 15)

END

OF SEMESTER

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