EC421RW3057

Course Code : ECT 252 MQNR/RW – 21 / 1032

Third Semester B. Tech. / B. E. (Electronics and Communication Engineering) Examination

DIGITAL SYSTEM DESIGN

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

(1) All questions carry marks as indicated.
(2) Assume suitable data wherever necessary.

1. Write Verilog code for a digital circuit described by the following Boolean Equation :

$$Y(A, B, C) = \overline{A}B + BC + \overline{B}\,\overline{C}$$

Use only Nand gates. 6 (CO 1)

2. (a) Evaluate the output of following Verilog statements : (CO 1)

Consider a = 4'b0010, b = 2'd3, c = 5'ha.

(i) {a, 2'd0, b, c}. 1

(ii) a & c and a && c. 1

(iii) a + c. 1

(iv) if (!a) and if (~c). 1

(b) List ways of connecting ports with external signals in Verilog along with an example. 4 (CO 1)

3. (a) Write a Verilog code for 4 – bit parallel adder using 1 – bit adders. 7 (CO 2)

4. (a) Write a Verilog code for 8 – bit Serial – in Serial – out shift register. 6 (CO 2)

5. Explain PAL architecture. 7 (CO 3)

6. Explain following performance parameters of logic family. State typical value of these parameters for any one logic family :

   (i) Power dissipation.

   (ii) Propagation delay.

   (iii) Noise margin. 6 (CO 4)

Course Code : MAT 255 MQNR/RW – 21 / 1035

Third Semester B. Tech./B. E. (Electronics and Communication Engineering) Examination

ENGINEERING MATHEMATICS

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

(1) Use of non-programmable calculators are allowed.
(2) All questions carry marks as indicated against them.
(3) Use of statistical tables are permitted.

Solve the following questions :

1. Determine the analytic function $z = u + iv$ if

$$u + v = \frac{2\sin 2x}{e^{2y} - e^{-2y} - 2\cos 2x}.$$

5(CO2)

2. Show that under the transformation $w = 1/z$, circle $x^2 + y^2 - 6x = 0$ is transformed into a straight line in the w-plane. 5(CO2)

3. Apply the calculus of residues to prove that

$$\int_0^{2\pi} \frac{d\theta}{(5-3\cos\theta)^2} = \frac{5\pi}{32}.$$

5(CO2)

4. Solve the following partial differential equation
$(D^3 + D^2D' - DD'^2 - D'^3)\, z = e^x \cos 2y$ 5(CO1)

5. Evaluate by using Laplace Transform

$$\int_0^{\infty} e^{-t} \left(\frac{\cos at - \cos bt}{t} \right) dt$$

5(CO3)

6. Solve the following differential equation by using Laplace transform
$(D^3 - 3D^2 + 3D - 1)\ y = t^2e^{2t}$ where $y(0) = 1$,
$y'(0) = 0$; $y''(0) = -2$ 5(CO3)

7. Using $Z(n) = \frac{z}{(z-1)^2}$ show that

$$Z(n\cos n\theta) = \frac{(z^3 + z)\cos\theta - 2z^2}{(z^2 - 2z\cos\theta + 1)^2}$$ 5(CO3)

8. Find the response of the system given by $y_n + 3y_{n-1} = u_n$; where u_n is unit step sequence and $y(-1) = 1$ 5(CO3)

Course Code : ECT 251 MQNR/RW – 21 / 1031

Third Semester B. Tech. / B. E. (Electronics and Communication Engineering) Examination

ELECTRONIC DEVICES

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated against them.
(3) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. (a) Construct a complete circuit of a DC regulated power supply to obtain an output voltage of 5 volts. Use Zener diode as a voltage regulating element. 4(CO1)

(b) A voltage of 200 cos ωt is applied to half wave rectifier using a diode 1N4007 with load resistance of 5 KΩ. Evaluate the maximum DC current component, rms current, ripple factor and rectifier efficiency. Assume diode and transformer used in the circuit are ideal. 4(CO1)

2. (a) What is the value of base resistance, RB for the Figure 2(a) ? Transistor is silicon NPN type.

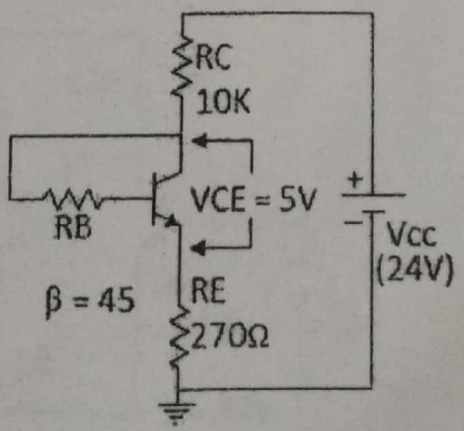

Figure 2(a)

4(CO2)

(b) Figure 2(b) is the transformer coupled amplifier. If V_{BE} = 0.7 volts, β of a silicon NPN transistor = 50 and V_{CE} = 5 volts, then find out the values of emitter resistance and stability factor S.

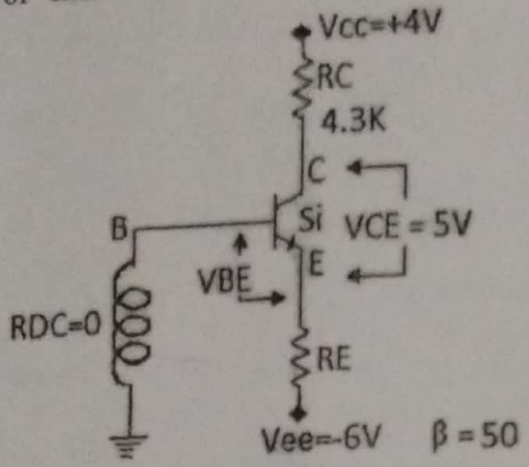

Figure 2(b)

4(CO2)

3. (a) Field effect transistor is known to produce variable voltage resistance region, do you agree ? Explain with justification. 4(CO3)

(b) Analyze self-bias circuit of junction field effect transistor. 4(CO3)

4. Figure 4 shows two stage amplifier in CE-CC configuration. The transistor parameters are $hie = 2\,K\Omega$, $hfe = 50$, $hre = 6 \times 10^{-4}$, $hoe = 25\,\mu A/V$, $hic = 2\,K\Omega$, $hfc = -51$, $hrc = 1$ and $hoc = 25\,\mu A/V$. Determine input and output impedances Ri1 and R0'. Also find individual and overall voltage and current gain.

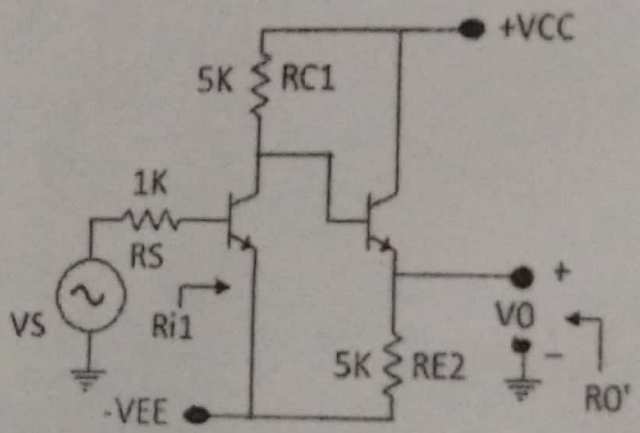

Figure 4

8(CO2)

5. (a) With reference to MOSFET devices, justify the following statements :

(i) N-channel type is preferred over P-channel type.

(ii) The polarity of the inversion layer is same as that of the majority carries in the source. 4(CO4)

(b) Explain NAND, NOR and X-OR logics using CMOS and verify their truth tables. 4(CO4)

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Course Code : ECT 253 MQNR/RW – 21 / 1033

Third Semester B. Tech. / B. E. (Electronics and Communication Engineering) Examination

SIGNALS AND SYSTEMS

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

(1) All questions are compulsory and carry marks as indicated.
(2) Assume suitable data wherever necessary.
(3) Illustrate your answers wherever necessary with the help of neat sketches.
(4) Due credit will be given to neatness.
(5) Use of Non – programmable calculator is permitted.

1. (a) Given, $x(t) = \begin{cases} (t+2) & -2 \leq t \leq -1 \\ 1, & -1 < t \leq 0 \\ -2, & 0 < t \leq 3 \\ 0, & \text{Otherwise} \end{cases}$

Deduce the analytic expression and Sketch the following signals.

(a) $x(-2t + 2)$ (b) $x\left(4 - \frac{t}{2}\right)$ 4(CO1)

(b) Sketch the following signals

(a) $x(t) = (t+1)\ u(t+1) - 2t\ u(t) + (t-1)\ u(t-1)$

(b) $x(t) = r(t) - 2u(t-1) + r(t-2)$ 2(CO1)

(c) (i) Compute the energy of the following signal

$x(t) = \cos(10\pi t)\, u(t)\, u(2-t)$ 2(CO1)

(ii) Check whether the following system is linear.

$\frac{dy(t)}{dt} + 3ty(t) = t^2x(t)$ 2(CO1)

2. The input and impulse response of DT-LTI system are
$x[n] = 2u[n+3] - 5u[n+1] + 3u[n-2]$;
$h[n] = 4\delta[n+2] + 7\,\delta[n+1] + 2\delta[n-1] + 3\delta[n-2] + \delta[n-3]$
Respectively. Obtain the output y[n] of the system. 6(CO2)

3. Determine the response of the CT-LTI system which has impulse response $h(t) = \delta(t-5)$ and input $x(t) = \cos(3t) + \cos(6t)$ 6(CO3)

4. Find the inverse Z-transform of the $X(z) = \frac{z}{(z-1)^3}$. 6(CO3)

5. A causal LTI system has frequency response $H(j\omega) = \frac{1}{j\omega+4}$ for a particular input x(t).\ This system is observed to produce an output $y(t) = (e^{-4t} - e^{-5t})\ u(t)$. Determine the input x(t). Plot the magnitude and phase spectrum of this system. 6(CO4)

6. Determine frequency response of the Discrete Time signal
$x(n) = \left(\frac{1}{5}\right)^n \mu(n)$. Plot its magnitude spectrum and Phase spectrum.

OR

Determine the Fourier Series representation for the signal

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

Plot its magnitude and phase spectrum. 6(CO4)

Course Code : ECT 254 MQNR/RW – 21 / 1034

Third Semester B. Tech. / B. E. (Electronics and Communication Engineering) Examination

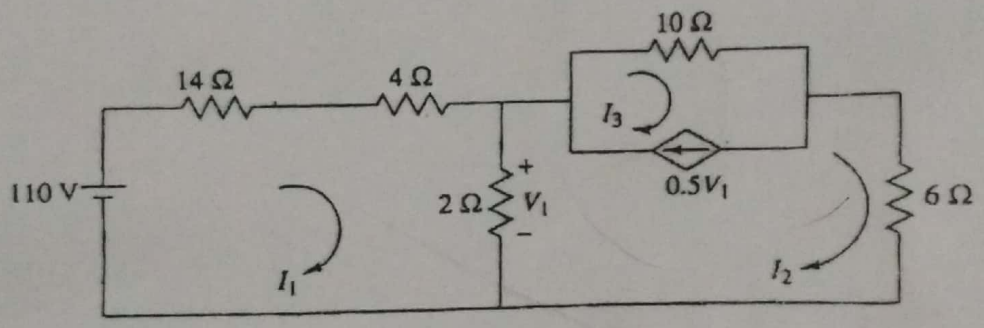
NETWORK THEORY

Time : 2 Hours] [Max. Marks : 40

Instructions to Candidates :—

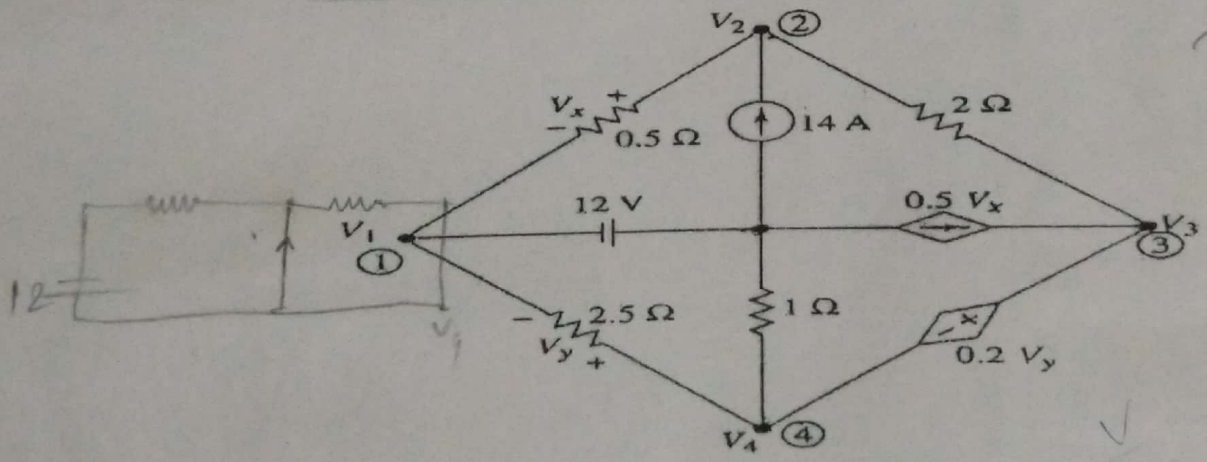
(1) Marks to each question are as mentioned just after it.
(2) Draw neat and clean diagram, wherever necessary.
(3) Use of non – programmable calculator is permitted.
(4) Assume suitable data wherever necessary.
(5) Use your available time wisely.

1. (a) Find the currents I_1 and I_2 using mesh analysis in the below given network.



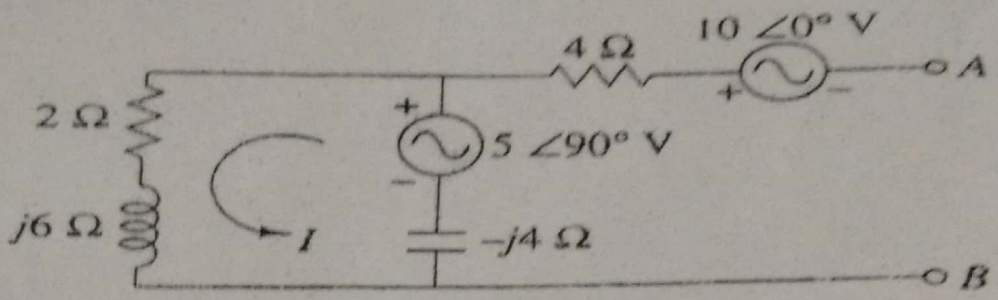
5(CO1)

(b) Find the nodal voltages (V_1, V_2, V_3, V_4) in the given circuit by selecting central node as reference node.



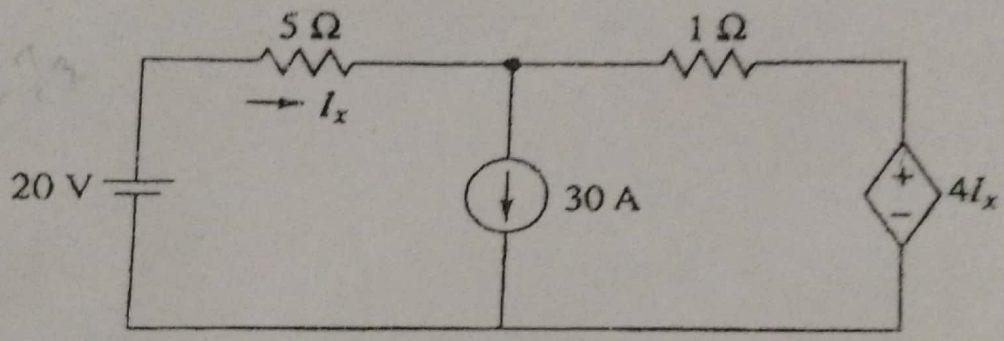
5(CO1)

2. (a) Find the thevenin's equivalent circuit across the terminals A and B in below given network.



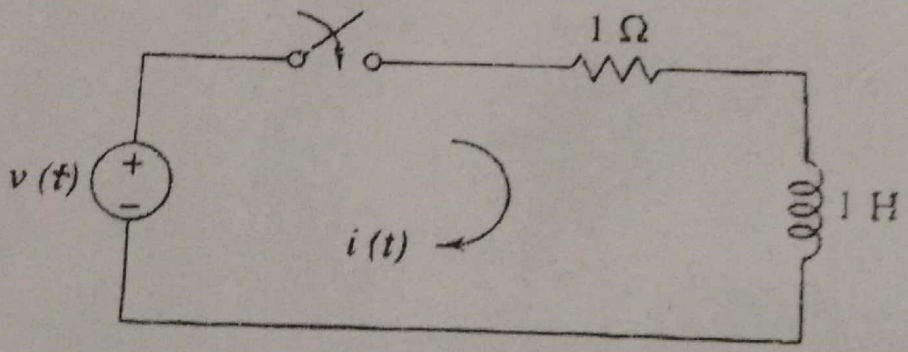
5(CO2)

(b) Determine the value of I_X using superposition theorem in below given network.



5(CO2)

3. (a) At t = 0, unit pulse voltage of unit width is applied to a series RL circuit which is initially uncharged, as shown in below network. Obtain the expression for current $i(t)$ at 't > 0'. Switch is closed at t = 0.



5(CO3)