CBCS Scheme

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15EC32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Analog Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Derive an expression for input impedance, output impedance, voltage gain and current gain of un bypassed R_E common emitter amplifier using r_e model. **(08 Marks)**

b. Write the re-model of a Darlington emitter follower. Also determine input impedance, output impedance and voltage gain for the circuit. **(08 Marks)**

OR

2 a. Derive an expression for input impedance, output impedance, voltage gain and current gain of transistor amplifier using h-parameters. **(08 Marks)**

b. Determine voltage gain and current gain of emitter follower. Where $V_{CC} = 10V$, $R_B = 100K$, $R_E = 1K\Omega$, $h_{ie} = 1.1K\Omega$, $h_{fe} = 100$. Use approximate hybrid model. **(04 Marks)**

c. Design common emitter amplifier shown in Fig.Q.2(c) hfe = 100, $V_{CE} = 5V$. **(04 Marks)**

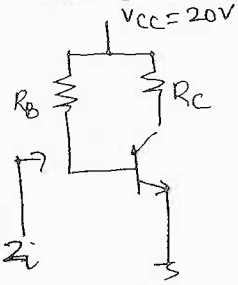

Fig.Q.2(c)

Module-2

3 a. Explain the working principle of JFET. Determine JFET parameters from characteristics. **(06 Marks)**

b. Derive an expression for output resistance and voltage gain of fixed bias FET amplifier. **(06 Marks)**

c. Calculate voltage gain of self bias FET amplifier. The circuit uses $R_D = 2K\Omega$, $R_S = 1K\Omega$, $r_d = 40K\Omega$, $g_m = 2mA/V$, $R_G = 2M\Omega$. **(04 Marks)**

OR

4 a. Explain construction and working principle of enhancement type MOSFET. **(06 Marks)**

b. Derive an expression for output impedance input impedance and voltage gain of common gate amplifier. **(07 Marks)**

c. Distinguish between JFET and enhancement type MOSFET. **(03 Marks)**

Module-3

5 a. Derive an expression for low frequency response of BJT amplifier due to capacitors C_S, C_E and C_C. **(08 Marks)**

b. Estimate F_{LG}, F_{LS} and F_{LC} of the circuit shown in Fig.Q.5(b). The circuit uses $R_{sig} = 10K\Omega$, $R_G = 1M\Omega$, $R_D = 2.2K$, $R_L = 4.7K\Omega$, $r_d = \infty$, $R_S = 1K\Omega$, $g_m = 2ms$, $C_G = 0.01\mu F$, $C_S = 0.47\ \mu F$, $C_C = 0.1\ \mu F$. Plot the response. **(08 Marks)**

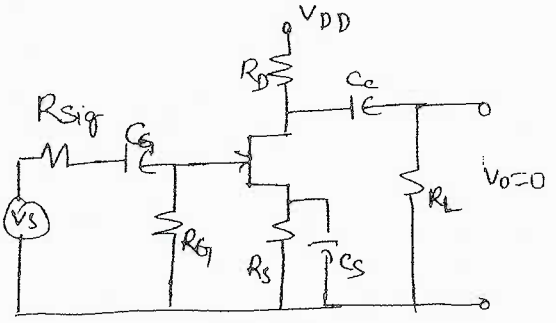

Fig.Q.5(b)

OR

6 a. Define Miller's theorem. Determine equivalent input and output capacitances of the circuit. **(08 Marks)**

b. Calculate the f_{Hi} of BJT amplifier. The transistor amplifier uses silicon transistor with $V_{CC} = 20V$, $R_1 = 90K\Omega$, $R_2 = 10K\Omega$, $R_C = 5K$, $R_L = 5K\Omega$, $R_E = 1.5K\Omega$, $C_S = C_C = C_E = 0.1\mu F$, $r_0 = r_{ce} = \infty$, $C_{be} = 100pF$, $C_{bc} = 3pF$, $C_{ce} = 5pF$, $c_{wi} = C_{wo} = 6pF$, $\beta = 100$, $R_S = 10K\Omega$. **(08 Marks)**

Module-4

7 a. Determine input resistance and output resistance of voltage series feedback amplifier. **(06 Marks)**

b. Briefly explain characteristics of negative feedback amplifier. **(06 Marks)**

c. An amplifier without feedback gives a fundamental output 36V with 7 percent second-harmonic distortion when the input is 0.028V. If 1.2 percent of the output is feedback into the input in a negative voltage series feedback circuit. Determine the output voltage. **(04 Marks)**

OR

8 a. Explain FET phase shift oscillator with neat diagram and necessary equation. **(06 Marks)**

b. Explain the working of wein bridge oscillator. **(06 Marks)**

c. Calculate the oscillator frequency for an FET Hartley oscillator with tank circuit elements $C = 250pF$, $L_1 = 1.5mH$ and $L_2 = 2.5mH$. Also calculate the gain of an amplifier. **(04 Marks)**

Module-5

9 a. Derive and expression for second harmonic distortion. **(05 Marks)**

b. Show that maximum conversion gain of transformer coupled class A amplifier is 50%. **(06 Marks)**

c. Calculate the harmonic distortion components for an output signal having fundamental amplitude of 2.1V, second harmonic amplitude of 0.3V, third harmonic component of 0.1V and fourth harmonic component of 0.05V. Also calculate the total harmonic distortion. **(05 Marks)**

OR

10 a. Derive an expression for conversion gain of class B push full amplifier with neat circuit diagram and waveform. **(08 Marks)**

b. Define voltage regulator. Explain the server voltage regulator using transistor. **(08 Marks)**

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10ES32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Explain the static and dynamic resistance of the diode. **(04 Marks)**

b. For the circuit shown in Fig. Q1 (b). Find I_D, V_1, V_2 and V_0. Assume silicon diode. **(08 Marks)**

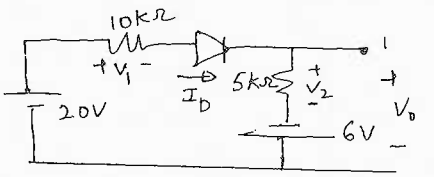

Fig. Q1 (b)

c. For the clipping circuit shown in Fig. Q1 (c). Draw the transfer characteristics and output voltage waveforms. Assume silicon diodes. **(08 Marks)**

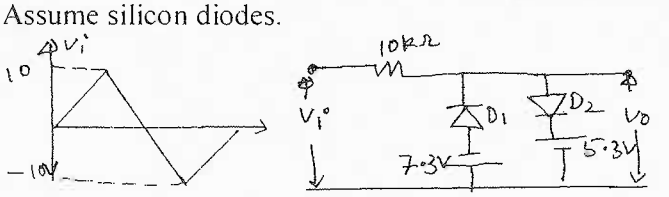

Fig. Q1 (c)

2 a. For a emitter bias circuit shown in Fig. Q2 (a). Find

i) Quiescent values of base and collector currents. ii) Quiescent values of V_{CE}.

iii) Voltage at base to ground and collector to ground. iv) Base to collector voltage.

Assume $V_{BE} = 0.7$ V, $\beta = 60$ **(10 Marks)**

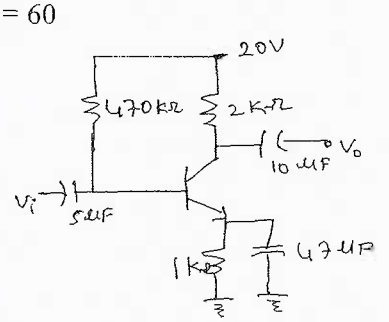

Fig. Q2 (a)

b. For the voltage divider bias configuration. Derive expression for I_C and V_{CE} and expression for collector current when it is in saturation. Comment on stability factor. **(10 Marks)**

3 a. Describe how transistor behaves as switch. Also describe transistor switching time. **(06 Marks)**

b. For common base npn transistor configuration with $I_E = 4$ mA, $\alpha = 0.98$ and ac signal of 2 mV applied between base and emitter terminals. Determine:

i) Input impedance ii) The voltage gain of load 0.56 KΩ is connected to output terminals.

iii) Output impedance. iv) Current gain. **(06 Marks)**

c. Explain common emitter fixed bias configuration. Derive expression for the input impedance, output impedance, voltage gain and current gain. **(08 Marks)**

4 a. Explain low frequency response of BJT amplifier. Derive the expression for lower cut-off frequency considering the effect of input coupling capacitor C_S. **(10 Marks)**

b. For the circuit shown in Fig. Q4 (b). Calculate (i) f_{Hi} and f_{Ho}. (ii) f_β and f_T

Take $C_{be} = 35$ P.F, $C_{bc} = 5$ P.F, $C_{ce} = 1$ PF, $C_{Wi} = 6$ PF, $C_{WO} = 10$ P.F, $\beta = 100$ and $V_0 = \infty$. **(10 Marks)**

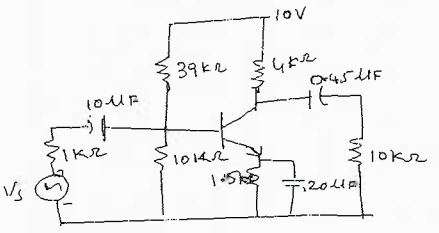

Fig. Q4 (b)

PART – B

5 a. Explain Darlington emitter follower. Draw the equivalent circuit. Derive expression for input impedance (Z_I), current gain (A_I), Voltage gain A_V and output impedance (Z_0). **(10 Marks)**

b. Determine the voltage gain, input and output impedance with voltage series feedback having $A = -100$, $R_i = 10$ KΩ, $R_0 = 20$ KΩ for feedback factor $\beta = -0.1$. **(06 Marks)**

c. Discuss the advantages of negative feedback. **(04 Marks)**

6 a. Describe FET amplifier with voltage series feedback. Derive the expression for gain. **(10 Marks)**

b. Explain the principles of class B amplifier operation. Derive expression for
(i) input dc power (ii) Output ac power (iii) η-efficiency
(iv) power dissipated by output transistor. **(10 Marks)**

7 a. Write the basic principle of oscillator. Also state the conditions for oscillation. **(04 Marks)**

b. Describe any one type of tunned oscillator with relevant diagram. Write expression for frequency of oscillations. **(08 Marks)**

c. RC phase shift oscillator $R_C = 5$ kΩ and $R = 3.3$ kΩ. Find the range of values of capacitor if it is required to vary frequency from 100 Hz to 20 kHz. **(08 Marks)**

8 a. Explain common gate JFET configuration with relevant circuit diagram. Draw equivalent circuit. Derive expression for Z_i, Z_0 and A_V. **(08 Marks)**

b. The self biased configuration of JFET has operating point defined by $V_{GSQ} = -2.6$ V and $I_{DQ} = 22.6$ mA and $I_{DSS} = 8$ mA and $V_P = -6$ V the value of $Y_{OS} = 20$ μS as shown in Fig.Q8 (b). Find (i) g_m (ii) r_d (iii) Z_i (iv) Z_0 **(06 Marks)**

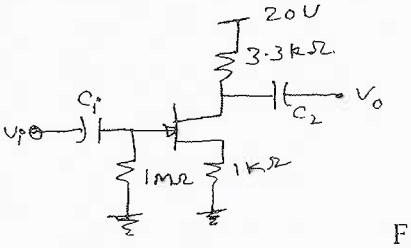

Fig. Q8 (b)

c. Differentiate depletion type MOSFET and enhancement type MOSFET. **(06 Marks)**

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CBCS Scheme

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15EC33

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Digital Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define the following: i) TVUM Table; ii) Combinational circuit; iii) Cannonical SOP; iv) Cannonical POS. **(04 Marks)**

b. Obtain minimal expression using k-map for the following incompletely specified function: $F(a, b, c, d) = \sum_{m}(0,1,4,6,7,9,15) + \sum_{d}(3,5,11,13)$ and draw the circuit diagram using gates. **(06 Marks)**

c. Write the truth table and design a circuit to generate o/p using K-map for the problem statement given: o/p of a combinational circuit having 4 inputs and an o/p, becomes logical '1' when two or more inputs goto logic level '1'. **(06 Marks)**

OR

2 a. Define K-map, incompletely specified function, essential prime implicants and grey code. **(04 Marks)**

b. Obtain minimal logical expression for the given maxterm expression using K-map. $f(a, b, c, d) = \pi_{M}(0,1,4,5,6,7,9,14).\pi_{d}(13,15)$. **(04 Marks)**

c. Use Quine McCluskey's method of minimization to obtain essential prime implicants and minimal expression for the following minterm expression: $f(a, b, c, d) = \sum_{m}(0, 1, 4, 5, 7, 8, 13, 15) + \sum_{d}(2)$. **(08 Marks)**

Module-2

3 a. Define encoder, decoder, priority encoder and multiplexer. **(04 Marks)**

b. Write block diagram representation of a full adder using 3:8 decoders. **(04 Marks)**

c. Design full adder using i) 8:1 MUX and ii) 4:1 MUX. **(08 Marks)**

OR

4 a. Explain Carry look ahead adder with neat diagram and relevant expressions. **(08 Marks)**

b. Design 2-bit comparator and briefly explain. **(08 Marks)**

Module-3

5 a. Define bistable element, latch, flip-flop and function table. **(04 Marks)**

b. Sketch timing diagrams for JK flipflop and D-flip-flop. **(06 Marks)**

c. Explain M/S JK flip-flop with the help of circuit diagram and waveforms. **(06 Marks)**

OR

6 a. Find characteristic equations for T and SR-flip-flops with the help of function tables. **(06 Marks)**

b. Write circuit diagram for the edge triggered D-flip-flop and provide explanation for different input condition. **(06 Marks)**

c. Explain the operation of a switch debouncer built using SR-latch with the help of waveforms. **(04 Marks)**

Module-4

7 a. Define register, asynchronous ripple counter synchronous counter and ring counter. **(04 Marks)**

b. Design mod-8 counter using right shift register. Use D-flip-flop to build register circuit. Explain the operation using function table. **(06 Marks)**

c. Write timing diagrams, counting sequence and the logic diagram for 4-bit ripple counter and briefly explain. **(06 Marks)**

OR

8 a. Explain PIPO and SIPO operations using single diagram. **(06 Marks)**

b. Design Mod-6 synchronous counter using JK flip-flop. The sequence is 000, 001, 011, 100, 101, 111...000. **(07 Marks)**

c. Write state diagram for Mod-5 self correcting counter and briefly explain. The sequence is 000, 001, 101, 110, 111, 000. **(03 Marks)**

Module-5

9 a. What are Melay and Moore models of a sequential circuit? Briefly explain with diagrams. **(04 Marks)**

b. Write characteristic/excitation table for JK flip-flop and explain. **(03 Marks)**

c. Analyze the following sequential circuit. Writ excitation equations K-maps and state diagrams to analyze. **(09 Marks)**

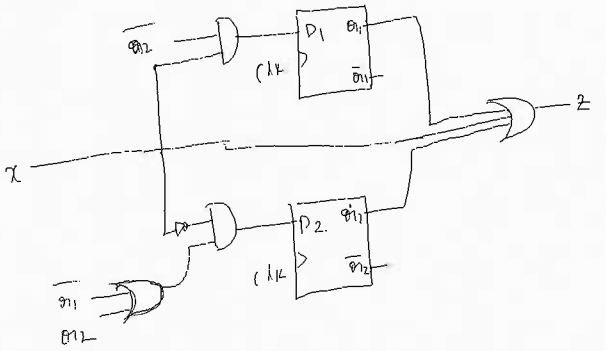

Fig.Q.9(c)

OR

10 a. Write state diagrams for a four state machine using Melay and Moore models and briefly explain. **(04 Marks)**

b. What is a state table? Give an example. **(02 Marks)**

c. Design a counter circuit for the following state table. Follow the standard steps for design. **(10 Marks)**

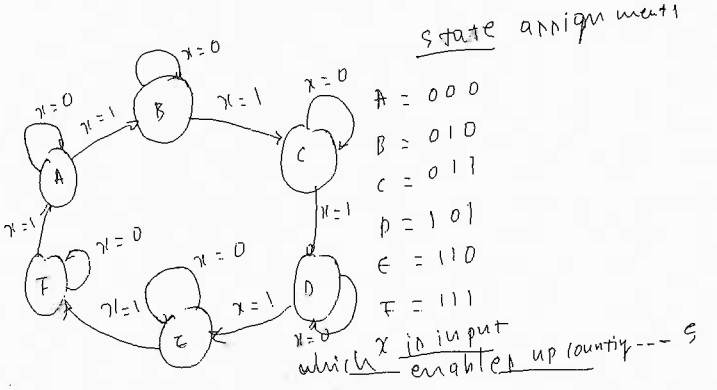

Fig.Q.10(c)

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10ES34

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: *1.Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data may be assumed suitably.

PART – A

1 a. Using source transformation and shifting, obtain the power consumed in 8Ω resistance of the network shown in Fig.Q1(a). **(06 Marks)**

b. Determine all the node voltages of the circuit shown in Fig.Q1(b) using nodal analysis. **(06 Marks)**

c. Find the value of Vs such that the current in –j11Ω is zero, use mesh analysis assuming all the loop currents are in clockwise directions. Refer Fig. 1(c). **(08 Marks)**

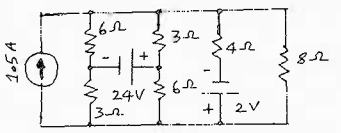

Fig. Q1(a)

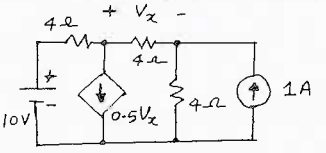

Fig. Q1(b)

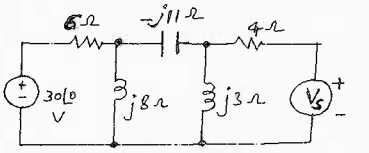

Fig. Q1(c)

2 a. Draw the dual of the network shown in Fig. 2(a). Write the corresponding equations for both networks. **(08 Marks)**

b. Draw the graph of the network shown in Fig. Q2(b), select links as the branches containing voltage sources. Write tie-set schedule and there from obtain all the branch currents and voltages. **(12 Marks)**

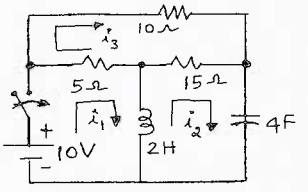

Fig.Q2(a)

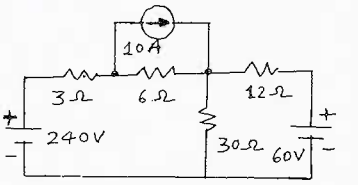

Fig. Q2(b)

3 a. Determine the current and voltage across 4Ω resistance of the network shown in Fig. Q3(a), using superposition theorem. **(06 Marks)**

b. Apply Millman's theorem to find V_0 and I_0 for the circuit shown in Fig. 3(b). **(08 Marks)**

c. State and explain the reciprocity theorem. **(06 Marks)**

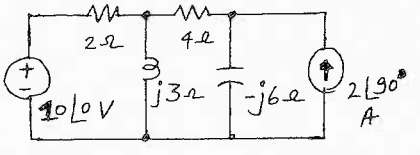

Fig.Q3(a)

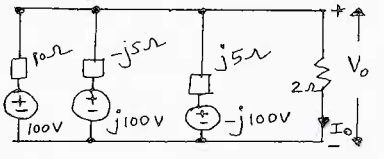

Fig.Q3(b)

4 a. A linear bilateral network consisting of passive elements is shown in Fig. 4(a), with V_s = 10V. V_{ab} is 5V. If 'ab' is shorted, I_{ab} = 1A for V_s = 15V. Determine the current when R_{ab} = 2.5Ω with V_s = 12V. **(04 Marks)**

b. Determine the Norton's equivalent of the circuit shown in Fig. 4(b). **(08 Marks)**

c. What value of impedance Z_L results in maximum power transfer condition for the network shown in Fig. Q4(c)? Also determine the corresponding power. **(08 Marks)**

Fig. Q4(a)

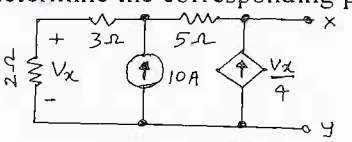

Fig. Q4(b)

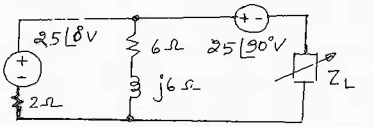

Fig. Q4(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

5 a. A series R – L – C circuit is fed with 50 V rms supply. At resonance, the current through the circuit is 25A and the voltage across inductor is 1250 volts. If G = 4 μF, determine the values of R, L Q, resonant frequency, bandwidth and half power frequencies. **(12 Marks)**

b. Obtain the condition for resonance of elements as shown in Fig. 5(b). Derive the expression for total impedance at resonance. **(08 Marks)**

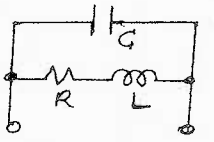

Fig. Q5(b)

6 a. The switch 'K' in the circuit shown in Fig. 6(a) is in open position for a long time and at time t = 0, it is closed. Determine the values of i_1 and i_2 along with their first and second derivatives at t = 0+. **(10 Marks)**

b. The switch 'S' is changed from position 1 to 2 at time t = 0. The circuit was under steady state before this action. Determine the value of v and i at t = 0+ and their first and second derivatives also. Refer Fig. 6(b). **(10 Marks)**

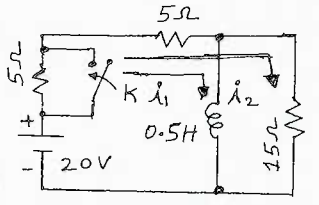

Fig. Q6(a)

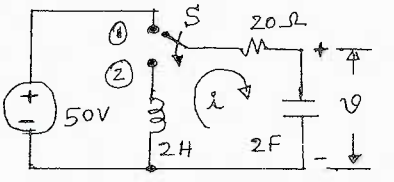

Fig. Q6(b)

7 a. Using Laplace transformation method obtain the expression for i(t). The capacitor charge is zero initially. Also obtain the expression for capacitor voltage in 'S' domain, refer Fig. 7(a). **(10 Marks)**

b. Using standard waveforms, express the waveform given (periodic) in Fig. 7(b) and obtain its Laplace transform. **(10 Marks)**

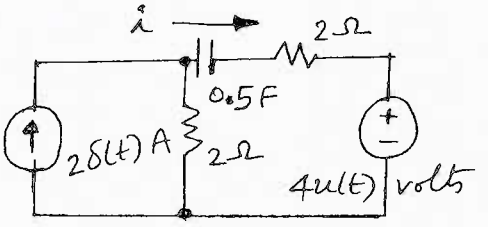

Fig. Q7(a)

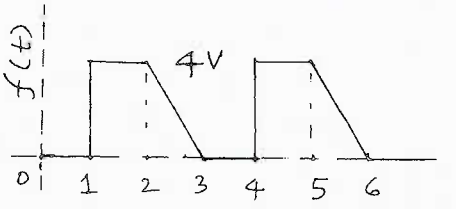

Fig. Q7(b)

8 a. Determine the Y–parameters of the network shown in Fig. Q8(a). **(10 Marks)**

b. Replace the circuit shown in Fig. 8(b) with its hybrid parameter equivalent network. **(10 Marks)**

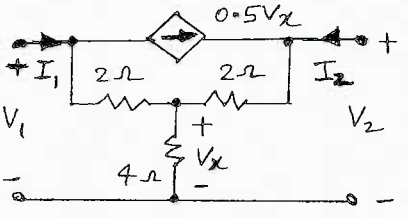

Fig. Q8(a)

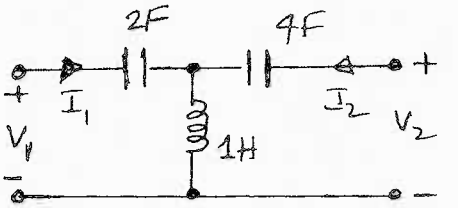

Fig. Q8(b)

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CBCS Scheme

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15EC34

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Network Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Derive the expression for i) Δ to Y transformation ii) Y to Δ transformation. **(10 Marks)**

b. Using source Transformation, find power delivered by 50V source. Shown in Fig Q1(b). **(06 Marks)**

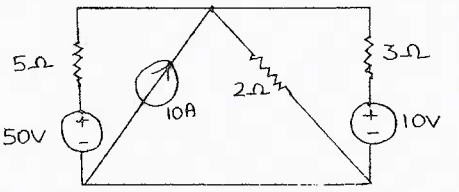

Fig Q1(b)

OR

2 a. Find the voltage across 20Ω resistor in the Network. Shown in Fig Q2(a) by Mesh analysis. **(08 Marks)**

b. Find i, using nodal analysis for the circuit shown in Fig Q2(b). **(08 Marks)**

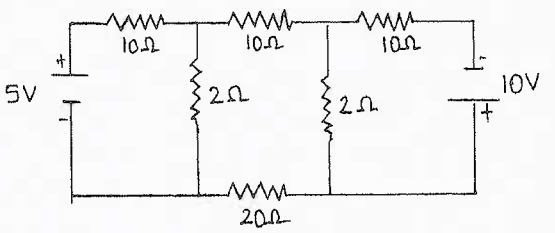

Fig Q2(a)

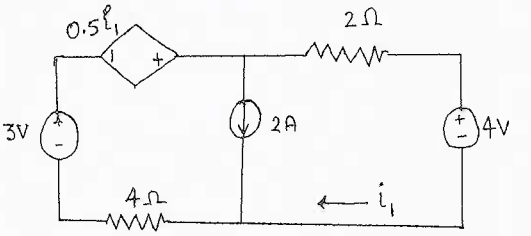

Fig Q2(b)

Module-2

3 a. State and prove maximum power transfer Theorem for AC circuits. **(08 Marks)**

b. For the network shown in Fig Q3(b), obtain the Thevenin's equivalent as seen from terminals p and q. **(08 Marks)**

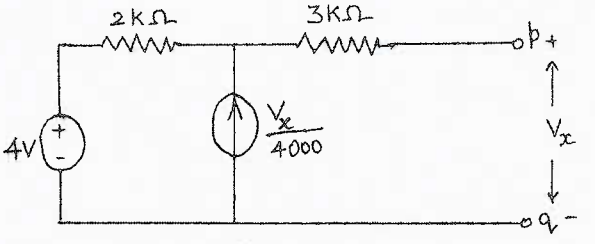

Fig Q3(b)

OR

4 a. State and explain Millman's theorem. **(08 Marks)**

b. Verify reciprocity theorem for the circuit shown in Fig Q4(b). **(08 Marks)**

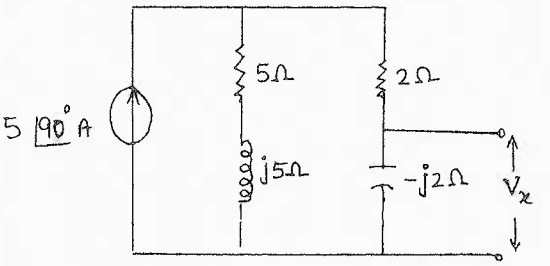

Fig Q4(b)

Module-3

5 a. Stat and prove initial value Theorem and final value theorem. **(08 Marks)**

b. In the circuit shown in Fig Q5(b) V = 10V, R = 10Ω, L = 1H, C = 10μF and V_c = 0. Find $i(0^+)$, $\frac{di}{dt}(0^+)$ and $\frac{d^2i}{dt^2}(0^+)$, it switch K is closed at t = 0. **(08 Marks)**

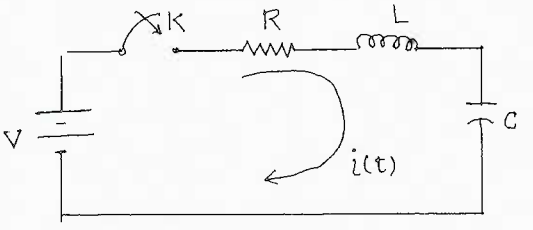

Fig Q5(b)

OR

6 a. In the network shown in Fig Q6(a), a steady state is reached with the switch K open. At t = 0, the switch is closed. For the element values given, determine the values of $V_a(0^-)$ and $V_a(0^+)$. **(08 Marks)**

b. Obtain the Laplace Transform of saw tooth waveform shown in Fig Q6(b). **(08 Marks)**

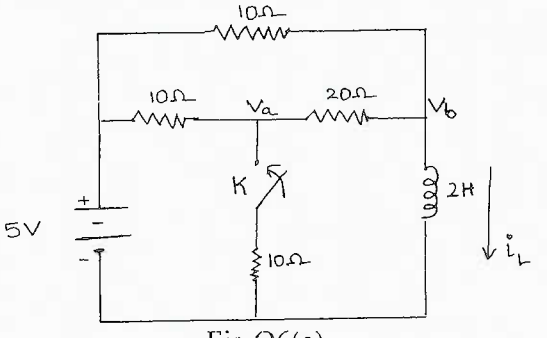

Fig Q6(a)

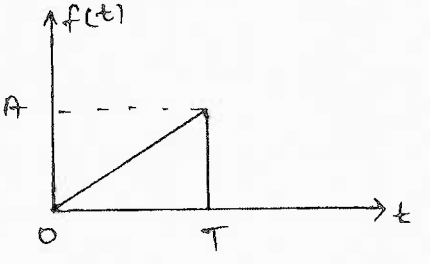

Fig Q6(b)

Module-4

7 a. Prove that $f_0 = \sqrt{f_1 f_2}$ where f_1 and f_2 are the two half power frequencies of a resonant circuits. **(08 Marks)**

b. A series RLC circuit consists of R = 10Ω, L = 0.01H and C = 0.01μF is connected across a supply of 10mV. Determine, i) f_0 ii) Q-factor iii) BW iv) f_1 and f_2 and v) I_0. **(08 Marks)**

OR

8 a. Obtain the expression for the resonant frequency for the circuit shown in Fig Q8(a) **(08 Marks)**

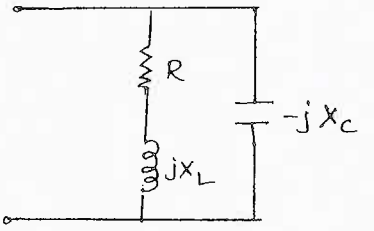

Fig Q8(a)

b. An RLC series circuit has an inductive coil of 'R' Ω resistance and inductance of 'L' H is in series with a capacitor 'C' F. The circuit draws a maximum current of 15A when connected to 230V, 50Hz supply. If the Q-factor is 5, find the parameter of the circuit. **(08 Marks)**

Module-5

9 a. Derive the z-parameters in terms of Y parameters. **(08 Marks)**

b. Determine Y parameter of the two – port network shown in Fig Q9(b). **(08 Marks)**

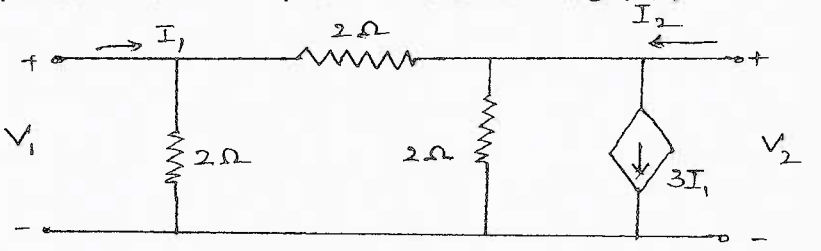

Fig Q9(b)

OR

10 a. Obtain hybrid parameters (h) in terms of impedance parameters (z). **(08 Marks)**

b. Find the Y parameters for the circuit shown in Fig Q10 (b). Then use the parameter relationship to find ABCD parameters. **(08 Marks)**

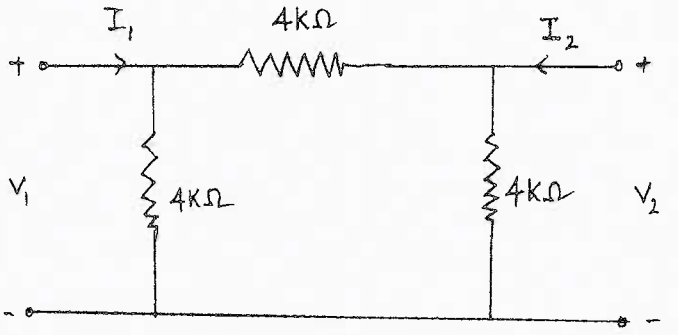

Fig Q10(b)

* * * * *

CBCS Scheme

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15EC35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electronic Instrumentation

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Convert a basic D'Arsonval movement into a dc voltmeter and derive the resistance equation. **(04 Marks)**

b. The expected value of the voltage across a resistor is 80 V. However the measurement gives a value of 79 V calculate (i) absolute error (ii) % error (iii) Relative accuracy (iv) % of accuracy. **(04 Marks)**

c. State different types of thermocouples used for RF current measurement and explain each one of them in brief. **(08 Marks)**

OR

2 a. Explain with diagram the operation of true RMS voltmeter. **(08 Marks)**

b. Explain with diagram the operation of a dc differential voltmeter. **(08 Marks)**

Module-2

3 a. Describe with a diagram, the operation of a voltage to time conversion type DVM. **(08 Marks)**

b. Explain with a diagram, the working of digital pH meter. **(08 Marks)**

OR

4 a. Describe with a diagram the operation of a successive approximation type DVM. **(08 Marks)**

b. Describe with the help of a diagram the operation of universal counter-timer. **(08 Marks)**

Module-3

5 a. Draw the basic block diagram of an oscilloscope and explain the function of each block. **(08 Marks)**

b. Describe with the help of neat block diagram the operation of modern laboratory signal generator. Explain the technique used to improve stability. **(08 Marks)**

OR

6 a. Sketch the block diagram and explain the AF sine and square wave generator. List the various controls on the front panel of AF sine and square wave generation. **(08 Marks)**

b. Discuss the important features of cathode ray tube (CRT). **(08 Marks)**

Module-4

7 a. Derive the balance equation for wheat stone bridge and mention the limitation. **(06 Marks)**

b. Determine the value of unknown resistance R_x in a wheat stone bridge if $R_1 = 10\ k\Omega$, $R_2 = 20\ k\Omega$ and $R_3 = 40\ k\Omega$. **(02 Marks)**

c. What is Meggar? Explain basic Meggar circuit. **(08 Marks)**

OR

8 a. Draw the circuit diagram and obtain balance condition for Maxwell's bridge, if bridge constants are $C_1 = 0.5\ \mu F$, $R_1 = 1200\ \Omega$, $R_2 = 700\ \Omega$, $R_3 = 300\ \Omega$, find resistance and inductance of the coil. **(08 Marks)**

b. Explain with a diagram the operation of stroboscope. **(08 Marks)**

Module-5

9 a. What is a thermistor? Explain different types of thermisters. **(08 Marks)**

b. List the factors to be considered while selecting transducers. **(08 Marks)**

OR

10 a. Explain with a diagram the operation of resistive pressure transducer. **(08 Marks)**

b. Explain construction, principle and working of LVDT. **(08 Marks)**

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CBCS Scheme

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15EC36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Point charges of 50 nano-coulomb each are located at A(1, 0, 0), B(–1, 0, 0), C(0, 1, 0) and D(0, –1, 0) in free space. Find the total force on the charge at A. **(08 Marks)**

b. Define electric field intensity and electric flux density. **(04 Marks)**

c. A uniform line charge of infinite length with $\rho_L = 40$ nc/m lies along z axis. Find $\bar{E}$ at (–2, 2, 8) in air. **(04 Marks)**

OR

2 a. Derive the expression for electric field intensity due to infinite line charge. **(08 Marks)**

b. Two particles having charges 2nano-coulomb and 5nano-coulomb are spaced 80 cm apart. Determine the electric field intensity at point "A" situated at a distance of 0.5 m from each of the two particles. Assume dielectric constant of 5. **(08 Marks)**

Module-2

3 a. Evaluate both sides of the divergence theorem for the field $\bar{D} = 2xy\,\hat{a}_x + x^2\,\hat{a}_y c/m^2$ and the rectangular parallel piped formed by the planes x = 0 and 1, y = 0 and 2, and z = 0 and 3. **(08 Marks)**

b. Derive the expression for equation of continuity. **(06 Marks)**

c. Give the vector density $J = 10\rho^2 z\,\hat{a}_\rho - 4\rho\cos^2\phi\,\hat{a}_\rho$ mA/m^2. Determine the total current flowing outward through the circular band. $\rho = 3$, $0 < \phi < 2\pi$, $2 < z < 2.8$. **(02 Marks)**

OR

4 a. State and explain Gauss law in point form. **(05 Marks)**

b. Given the electric field $\bar{E} = 2x\,\hat{a}_x - 4y\,\hat{a}_y$ v/m. Find the work done in moving a point charge +2C from (2, 0, 0,) to (0, 0, 0) and then form (0, 0, 0) to (0, 2, 0). **(05 Marks)**

c. A potential field in free space is expressed as $V = \frac{60\sin\theta}{r^2}$ v. Find the electric flux density at the point (3, 60°, 25°) in spherical co-ordinates. **(06 Marks)**

Module-3

5 a. State and explain uniqueness theorem. **(08 Marks)**

b. Determine the magnetic field intensity $\bar{H}$ at point P(0.4, 0.3, 0), if the 8A current in a conductor inward from infinity to origin on the x axis and outward to infinity along y axis. **(08 Marks)**

OR

6 a. Find the potential and volume charge density at P(0.5, 1.5, 1)m in free space given the potential field $V = 6\rho\phi Z$ volts. **(08 Marks)**

b. Explain the concepts of scalar and vector magnetic potential. **(08 Marks)**

Module-4

7 a. Derive an equation for the magnetic force between two differential current elements. **(06 Marks)**

b. Find the magnetization in a material where : i) $\mu = 1.8 \times 10^{-5}$ H/m and H = 120 A/m ii) $\mu_r = 22$. There are 8.3×10^{28} atom/m^3 and each atom has a dipole moment of 4.5×10^{-27} A/m^2. iii) B = 300 μT and $X_{on} = 15$. **(06 Marks)**

c. A conductor 4m long lies along the y axis with a current of 10A in the $\overline{ay}$ direction. Find the force on the conductor if the field in the region is $\overline{B} = 0.005\overline{ax}$ Tesla. **(04 Marks)**

OR

8 a. Find the expression for force on differential current element moving in a steady magnetic field. Deduce the result to a straight conductor in a uniform magnetic field. **(08 Marks)**

b. For region 1, $\mu_1 = 4\mu$H/m and for region 2, $\mu_2 = 6\mu$ H/m. The regions are separated by z = 0 plane. The surface current density at the boundary is $\overline{K} = 100\overline{ax}$ A/m. Find $\overline{B}_2$ if $\overline{B}_1 = 2\hat{a}x - 3\hat{a}y + \hat{a}z$ militesla for z > 0. **(08 Marks)**

Module-5

9 a. For the given medium $\varepsilon = 4 \times 10^{-9}$ F/m and $\sigma = 0$. Find 'K' so that the following pair of fields satisfy Maxwell's equation :

$\overline{E} = (20y - kt)\overline{ax}$ v/m

$\overline{H} = (y + 2\times10^6 t)\overline{az}$ A/m **(08 Marks)**

b. A plane wave of 16 GHz frequency and E = 10 v/m propagates through the body of salt water having constants $\varepsilon = 100$, $\mu_r = 1$ and $\sigma = 100$ S/m. Determine attenuation constant, phase shift, phase velocity and intrinsic impedance of the medium and depth of penetration. **(08 Marks)**

OR

10 a. State and explain Poynthing theorem. **(08 Marks)**

b. Find the amplitude of displacement current density in the free space within a large power distribution transformer where $\overline{H} = 10^6 \cos(377t + 1.2566\times10^{-6} z)\hat{ay}$ A/m. **(05 Marks)**

c. The depth of penetration in a conducting medium is 0.1m and the frequency of the electromagnetic wave is 1 MHz. Find the conductivity of the conducting medium. **(03 Marks)**

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10ES36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Field Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. State Coulombs law for the Force between any two point charges and indicate the units of Quantities in the force equation. **(06 Marks)**

b. On the line described by x = 2m, y = –4m there is uniform charge distribution of density $\rho_L = 20$ nc/m. Determine Electric field at P(–2, –1, 4)m. **(04 Marks)**

c. State and prove Gauss – Divergence theorem. **(10 Marks)**

2 a. Given the potential field $V = (50x^2yz + 20y^2)$ Volts in free space.
Find : i) V at P(–2, 3, 6) ii) $\overline{E}_p$ and iii) $\hat{a}r$ at P **(06 Marks)**

b. Derive an expression for energy expended by moving a point charge arbitrarily in an uniform electric field. **(06 Marks)**

c. Derive Laplace and Poisson's equations starting from the differential form of Gauss law. Express Laplace equation in all the three co-ordinate systems. **(08 Marks)**

3 a. Derive expression for energy stored in a capacitor and an expression after energy density in an electrostatic field. **(08 Marks)**

b. In cylindrical coordinate system planes are insulated along 'z' axis as shown in Fig 3(b). Neglect fringing effect and find expressions for $\vec{E}$ between the planes assuming a potential of 100V for $\phi = \alpha$ and a zero reference at $\phi = 0$. **(06 Marks)**

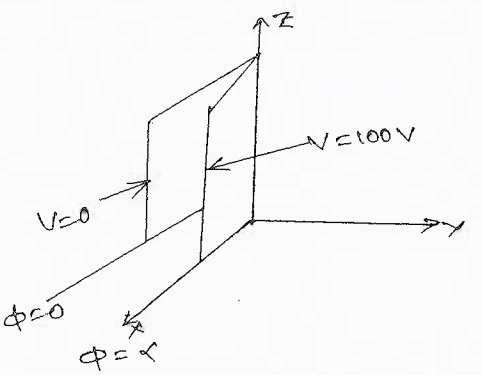

Fig Q3(b)

c. State and prove uniqueness theorem. **(06 Marks)**

4 a. An air cored torroid having a cross sectional area of $6cm^2$ and mean radium 15cm is wound uniformly with 500 turns carrying a current of 4A. Determine the magnetic flux density and field intensity of torroid. **(06 Marks)**

b. Derive an expression for Magnetic flux density at any point on the axis of Solenoid. **(08 Marks)**

c. State and explain Amperes circuital law. **(06 Marks)**

PART – B

5 a. Explain the concept of scalar and vector magnetic potential. **(08 Marks)**

b. Derive the boundary conditions at the interface between two different magnetic materials. **(06 Marks)**

c. Find the magnetic field intensity at the point P for the Fig Q5(c) shown below. **(06 Marks)**

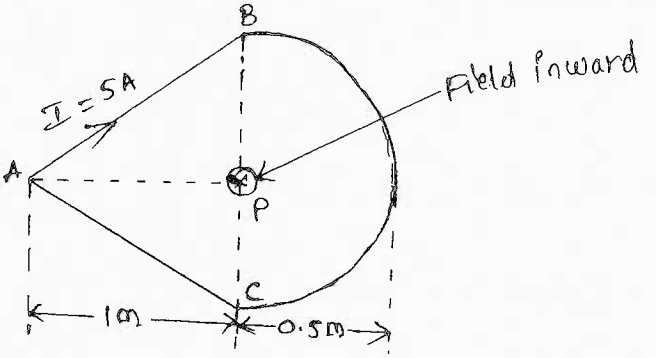

Fig Q5(c)

6 a. List out Maxwell's equations in point and integral forms for both static and time varying fields. **(08 Marks)**

b. Describe the continuity equation of current in differential form. **(06Marks)**

c. Show that conduction current in the wire is equal to the displacement current in the dielectric of a capacitor subjected to a time varying field. **(06 Marks)**

7 a. Explain how uniform plane wave is transverse in nature. Describe the skin depth or depth of penetration. **(10 Marks)**

b. A wave propagating in a Lossless dielectric has the Components.
$\vec{E} = 500\cos[10^7 t - \beta z]\,\hat{a}_z$ V/m and $\vec{H} = 1.1\cos[10^7 t - \beta z]\hat{a}_y$ A/m of the wave is travelling at V = 0.5C. Find : i) μ_r ii) ϵ_r iii) β iv) λ v) z. **(10 Marks)**

8 a. Derive the expressions for transmission co-efficient and reflection co-efficient of a uniform plane wave for normal incidence. **(10 Marks)**

b. Define SWR and derive the relationship between SWR and reflection coefficient. **(10 Marks)**

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10ES42

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Microcontrollers

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Distinguish Harvard and Von-Neumann (Princeton) architectures with diagrams. **(06 Marks)**

b. Explain with block diagram the architectural feature of 8051 and list out salient features of 8051 microcontroller. **(08 Marks)**

c. Discuss the need for stack memory in microcontrollers. Explain with examples the PUSH and POP instructions. **(06 Marks)**

2 a. What are the addressing modes supported by 8051 μC? Explain with examples. **(08 Marks)**

b. Explain the different types of conditional and unconditional jump instructions of 8051. Specify the different ranges associated with jump instructions. **(08 Marks)**

c. Differentiate between the following instructions:
i) SWAP and XCH ii) SJMP and LJMP. **(04 Marks)**

3 a. Write a ALP to copy the most significant nibble of A in both nibbles of RAM address 3Ch. Also write the algorithm for example if A = 36h, then 3Ch = 33h. **(06 Marks)**

b. Write an ALP to add the unsigned numbers found in internal RAM locations 25h, 26h and 27h together and put the result in RAM locations 31L (MSB) and 30h (LSB). **(08 Marks)**

c. For a machine cycle of 1.085 μsec find the time delay in the following subroutine:

```
DELAY: MOV R2, # 200
AGAIN: MOV R3, # 250
HERE: NOP
      NOP
      DJNZ R3, HERE
      DJNZ R2, AGAIN
      RET.
```

(06 Marks)

4 a. With a relevant figure write a sequence of events that occur in 8051 microcontroller when the CALL and RET instructions are executed. **(06 Marks)**

b. What are the ways to create time delay? Discuss the factors affecting the accuracy of the time delay. **(07 Marks)**

c. What are the differences between timer and counter? Explain with the formats of the SFR. **(07 Marks)**

PART – B

5 a. In what way timer/counter mode 2 programming is different from mode 0 and mode 1? **(06 Marks)**

b. Write an ALP to generate square wave on pin 3.4 of ON Time 4 msec and OFF Time 3 msec, using timer 0, mode 0. Assume that crystal frequency of 8051 is 11.0592 Hz. **(08 Marks)**

c. Explain the importance of interrupt priority (IP) SFR and the beginning fixed address of the interrupt handler subroutines. **(06 Marks)**

6 a. Write the steps required for programming 8051 to transfer data serially and what is the role of PCON register in serial communication? **(07 Marks)**

b. Write a C program to interface 8051 to LCD. Draw the hardware schematic. **(07 Marks)**

c. Write a 'ALP' program to interface stepper motor to 8051, with a neat diagram of 8051 connection to stepper motor. **(06 Marks)**

7 a. Tabulate the different data types in 'C', bits and the data range. **(05 Marks)**

b. Write an 8051 C program to send two different strings to the serial port. Assuming that SW is connected to pin P2.0, monitor its status and make a decision as follows:
SW = 0, send your first name
SW = 1, send your last name.
Assume XTAL = 11.0592 MHz, baud rate of 9600, 8 bit data 1 stop bit. **(10 Marks)**

c. Write a 'C' program to serially transmit the message "HELLO" continuously at baud rate of 9600, 8-bit data and 1 stop bit. **(05 Marks)**

8 a. Briefly discuss the features of MSP 430 microcontrollers. **(06 Marks)**

b. Explain different addressing modes of MSP 430 with examples. **(08 Marks)**

c. Write a MSP 430 assembly program to find the largest in the given array of 'n' bytes. **(06 Marks)**

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10ES43

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Control Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. A mechanical system is shown in the Fig.Q.1(a).
i) Obtain the performance equations.
ii) Draw the electrical analog based on force-current analogy. **(08 Marks)**

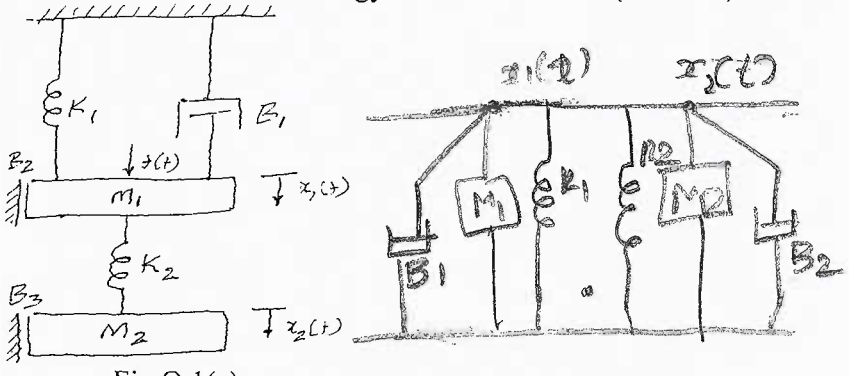

Fig.Q.1(a)

b. For the mechanical system shown in Fig.Q.1(b), draw the electrical network based on torque current analogy. Write the performance equations. **(08 Marks)**

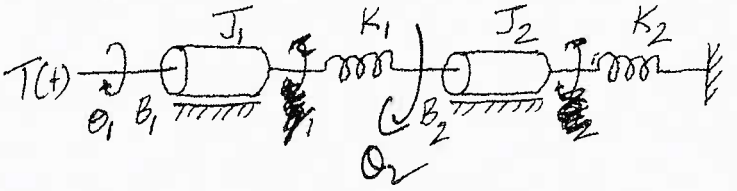

Fig.Q.1(b)

c. Write an explanatory note on gear trains. **(04 Marks)**

2 a. Define the term transfer function of a linear time invariant system. Derive the expression for the transfer function of a closed loop negative feedback system. **(06 Marks)**

b. For the block diagram shown in the Fig.Q.2(b), determine the overall transfer function using block diagram reduction rules. **(06 Marks)**

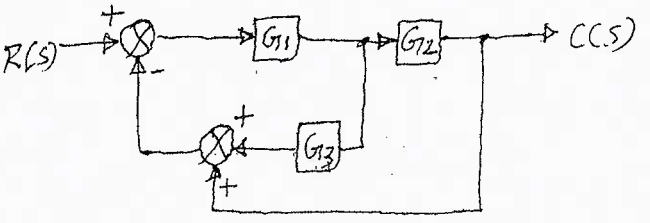

Fig.Q.2(b)

c. Consider the electrical circuit shown in Fig.Q.2(c). Find $\frac{V_0(s)}{V_i(s)}$ using Mason's gain formula. **(08 Marks)**

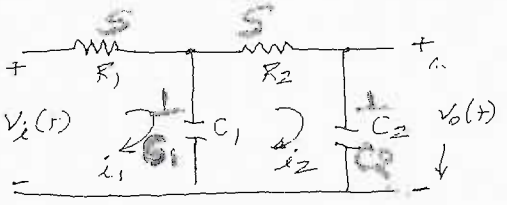

Fig.Q.2(c)

3 a. Define the following terms with respect to an underdamped second order system:
i) Peak time; ii) Settling time; iii) Steady state error. **(06 Marks)**

b. A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{K}{s(s+10)}$.
Determine the gain K so that the system will have a damping ratio of 0.5. For this value of K, determine settling time, peak over shoot and time to peak overshoot for a unit step input. **(08 Marks)**

c. For a unity feedback system whose open loop transfer function is $G(s) = \frac{50}{(1+0.1s)(1+2s)}$.
Find the error constants K_p, K_v, K_a. **(06 Marks)**

4 a. State the Routh's stability criterion and mention its limitation. **(04 Marks)**

b. Consider the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. Using Routh's criterion, determine the stability of the system. **(08 Marks)**

c. The closed loop system shown in Fig.Q.4(c) has $G(s) = \frac{K(s+30)}{s(s+5)}$ and $H(s) = \frac{1}{(s+15)}$.
Find the range of K for which system is stable. **(08 Marks)**

Fig.Q.4(c)

PART – B

5 a. Discuss the various rules for construction of root loci. **(08 Marks)**

b. A negative feedback control system is characterized by $G(s)H(s) = \frac{K}{s(s+1)(s+2)(s+3)}$.
Sketch the root locus plot for values of K ranging from 0 to ∞. Mark all the salient points on the root locus. **(12 Marks)**

6 a. Discuss the procedure to evaluate Gain margin and phase margin using Bode plots. **(06 Marks)**

b. Sketch the Bode plot for the transfer function $G(s) = \frac{Ks^2}{(1+0.2s)(1+0.02s)}$. Determine the system gain K for the gain cross over frequency to be 5 rad/sec. **(08 Marks)**

c. For the Bode magnitude asymptotic plot of Fig.Q.6(c), determine the transfer function in frequency domain. **(06 Marks)**

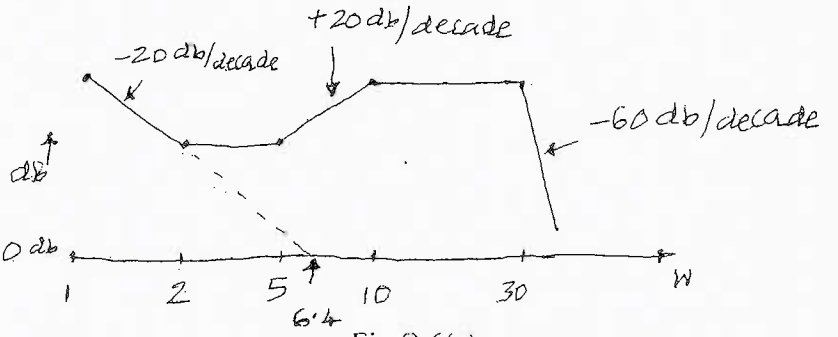

Fig.Q.6(c)

7 a. State the Nyquist stability criterion. **(06 Marks)**

b. Using the Nyquist stability criterion, investigate the stability of a closed loop system whose open loop transfer function is given by $G(s)H(s) = \frac{K}{(s+1)(s+2)}$. **(14 Marks)**

8 a. State the properties of state transition matrix. **(04 Marks)**

b. Represent the electrical circuit shown in Fig.Q.8(b) by a state model. **(08 Marks)**

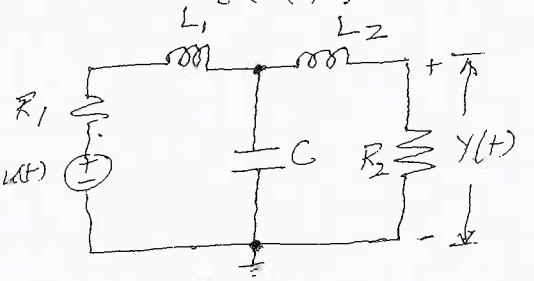

Fig.Q.8(b)

c. For the signal flow graph of Fig.Q.8(c) write the state and output equations: **(08 Marks)**

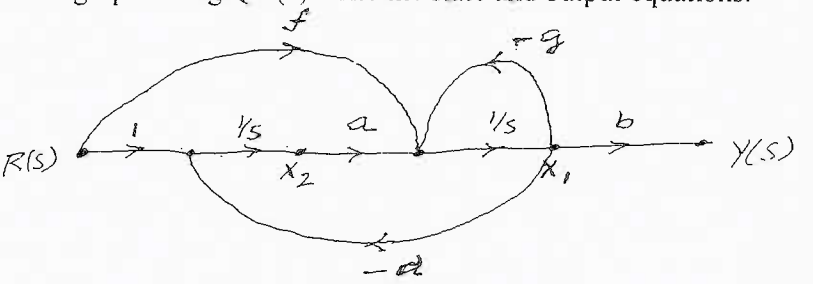

Fig.Q.8(c)

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10EC44

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Signals and Systems

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Determine and sketch the even and odd parts of the signal show in Fig.Q.1(a). **(05 Marks)**

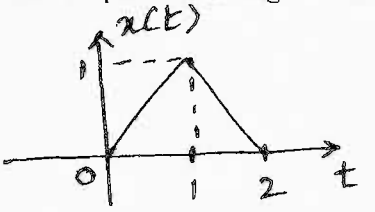

Fig.Q.1(a)

b. Sketch the waveforms of the following signals:
   i) $x(t) = u(t+1) - 2u(t) + u(t-1)$
   ii) $y(t) = r(t+1) - r(t) + r(t-2)$
   iii) $z(t) = -u(t+3) + 2u(t+1) - 2u(t-1) + u(t-3)$. **(09 Marks)**

c. For the following system, determine whether the system is: i) Memoryless; ii) Stable; iii) Causal; iv) Linear; v) Time-invariant.
   $y(n) = 2x(n)\, u(n)$. **(06 Marks)**

2 a. Derive the equation for convolution sum. **(05 Marks)**

b. Evaluate the discrete time convolution sum of
   $y(n) = (1/2)^n u(n-2) * u(n)$. **(05 Marks)**

c. Convolve the signals x(t) and h(t) shown below in Fig.Q.2(c). **(06 Marks)**

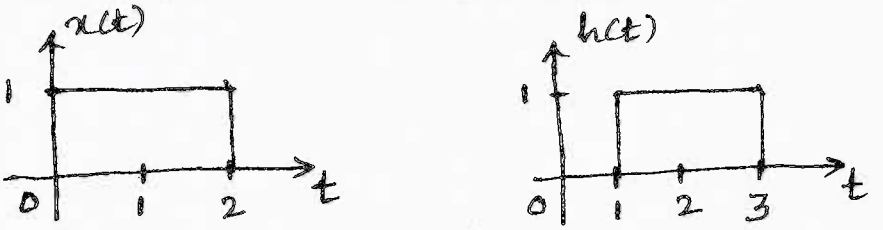

Fig.Q.2(c)

d. Convolve $x(n) = \{1, 2, \underset{\uparrow}{-1}, 1\}$ and $h(n) = \{1, \underset{\uparrow}{0}, 1\}$. **(04 Marks)**

3 a. Find the output, given the input and initial conditions, for the system described by the following differential equation:
   $x(t) = e^{-t} u(t)$, $y(0) = -1/2$, $y'(0) = 1/2$, $y''(t) + 5y'(t) + 6y(t) = x(t)$. **(07 Marks)**

b. Determine the forced response for the system described by the following difference equation and the specified input: $x(n) = 2u(n)$, $y(n) - \frac{9}{16} y(n-2) = x(n-1)$. **(07 Marks)**

c. Draw direct form-I and direct form-II implementations of the system described by the difference equation: $y(n) + \frac{1}{4} y(n-1) + \frac{1}{8} y(n-2) = x(n) + x(n-1)$. **(06 Marks)**

4 a. Prove the time shift and frequency shift properties of DTFs. **(06 Marks)**

b. Determine the DTFS of the signal

$$x(n) = \cos\left(\frac{\pi}{3}\right)n .$$ **(06 Marks)**

c. Evaluate the Fourier series representation of the signal $x(t) = \text{Sin } 2\pi t + \cos 3\pi t$. Also sketch the magnitude and phase spectra. **(08 Marks)**

PART – B

5 a. Prove the convolution property of DTFT. **(05 Marks)**

b. Find the DTFT of unit step sequence. **(07 Marks)**

c. Compute the Fourier transform of the signal

$$x(t) = \begin{cases} 1 + \cos \pi t; & |t| \le 1 \\ 0; & |t| > 1 \end{cases} .$$ **(08 Marks)**

6 a. The impulse response of a continuous time system is given by

$$h(t) = \frac{1}{RC} e^{-t/RC} u(t) .$$

Find the frequency response and plot the magnitude and phase response. **(05 Marks)**

b. Obtain the FT representation for the periodic signal $\sin w_o t$ and draw the spectrum. **(07 Marks)**

c. Find the DTFT representation for the periodic signal

$$x(n) = \cos\left(\frac{\pi}{3}\right)n$$

Also draw the spectrum. **(05 Marks)**

d. Write a note on sampling theorem and Nyquist rate. **(03 Marks)**

7 a. List the properties of region of convergence. **(05 Marks)**

b. Determine the Z-transform, the ROC, and the locations of poles and zeros of x(z) for the following signals: **(08 Marks)**

i) $x(n) = -\left(\frac{3}{4}\right)^n u(-n-1) + \left(\frac{-1}{3}\right)^n u(n)$ ii) $x(n) = n \sin\left(\frac{\pi}{2} n\right) u(-n) .$

c. Find the inverse Z-transform of

$$X(z) = \frac{1 - z^{-1} + z^{-2}}{\left(1 - \frac{1}{2} z^{-1}\right)\left(1 - 2z^{-1}\right)\left(1 - z^{-1}\right)}$$

with following ROCs i) $1 < |z| < 2$ ii) $\frac{1}{2} < |z| < 1$. **(07 Marks)**

8 a. Find the transfer function and impulse response of a causal LTI system if the input to the system is $x(n) = (-1/3)^n u(n)$ and the output is $y(n) = 3(-1)^n u(n) + (1/3)^n u(n)$. **(08 Marks)**

b. Determine the transfer function and difference equation representation of an LTI system described by the impulse response $h(n) = (1/3)^n u(n) + (1/2)^{n-2} u(n-1)$. **(04 Marks)**

c. Determine the forced response, natural response and output of the system described by the difference equation $y(n) + 3y(n-1) = x(n) + x(n-1)$, if the input is $x(n) = \left(\frac{1}{2}\right)^n u(n)$ and $y(-1) = 2$ is the initial condition. **(08 Marks)**

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10EC45

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Fundamentals of HDL

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain composite VHDL and verilog data types. **(08 Marks)**

b. If A, B and C are the unsigned variables with A = "110011", B = "010100", C = "101". Find the values of

(i) Y = &A (ii) Y = A && B (iii) Y = A sra 2

(iv) Y = B rol 2 (v) Y = A << 2 (vi) Y = A and not B xor 2 nand C **(07 Marks)**

c. Write the major differences between VHDL and verilog. **(05 Marks)**

2 a. Write a VHDL program in data flow style using signal assignment statements to implement a 2 to 1 multiplexer with active low enable signal (Ebar). If the propagation delay of each gate is 9 ns, calculate at what time the output is available when the input signals (A, B, select, Ebar) are changed at T_0, T_1 and T_2 as shown in Fig.Q2(a). **(07 Marks)**

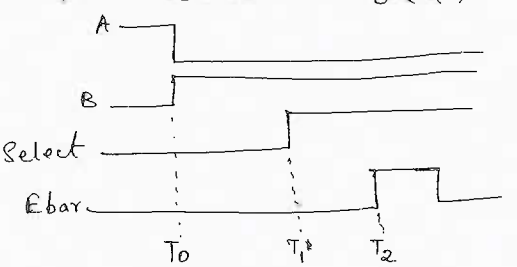

Fig.Q2(a)

b. Write a VHDL program to realize a D-latch in Data flow style, Consider enable signal as active low. **(06 Marks)**

c. Write a verilog program to implement a 3-bit carry-look ahead adder in data flow style. **(07 Marks)**

3 a. Compare signal and variable assignment statement. **(05 Marks)**

b. Write a verilog code to implement a positive edge triggered JK flip flop shown in Fig.Q3(b) in behavioural style using (i) else if and (ii) case statement. **(08 Marks)**

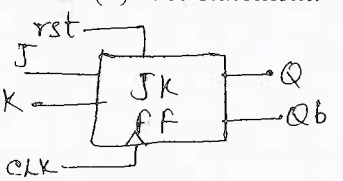

Fig.Q3(b)

c. Write the flow chart of Booth multiplication algorithm. Show the steps to find the product of two signed 5-bit numbers –5 and 9. **(07 Marks)**

4 a. Write a VHDL program to realize the block diagram shown in Fig.Q4(a) in structural style (No need to show the implementation of components). **(07 Marks)**

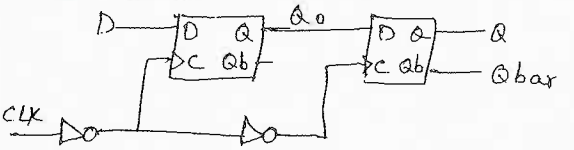

Fig.Q4(a)

b. Write a verilog program to implement a 4-bit magnitude comparator using 4-bit adders in structural style. **(07 Marks)**

c. Explain the following keywords (i) Generate (ii) Generic and (iii) Parameter. **(06 Marks)**

PART – B

5 a. Explain procedure with syntax and example in VHDL. **(06 Marks)**

b. Write a verilog program to convert an unsigned binary to an integer using task. **(08 Marks)**

c. Write a VHDL function to find the greater of two signed numbers. **(06 Marks)**

6 a. When mixed type description is preferred? Give example. **(06 Marks)**

b. Explain different VHDL user defined types. **(06 Marks)**

c. Write a verilog description of a 32×8 SRAM to implement the function table shown in Table 6(c).

CS	R/$\overline{WR}$	Memory Function
0	X	Deselected
1	1	Read cycle
1	0	Write cycle

Table 6(c) **(08 Marks)**

7 a. Explain how to invoke a VHDL entity from a verilog module. **(08 Marks)**

b. Write the block diagram of a 9-bit adder and implement it by mixed language description. **(12 Marks)**

8 a. What is synthesis? With a neat flow chart explain the steps involved in a synthesis process. **(10 Marks)**

b. Find the gate-level mapping for the verilog code given below:

```
module if_st(a, y)
input[2:0] a;
output y;
reg y;
always (a)
  begin
    if (a < 3' b 1 0 1)
      y =1' b 1;
    else
      y = 1' b 0;
    end
end module
```

(10 Marks)

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10EC46

Fourth Semester B.E. Degree Examination, Dec.2016/Jan.2017
Linear ICs and Applications

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of standard resistor value and standard capacitor value table is allowed.

PART – A

1 a. Define the following terms with respect to opamp and specify their typical values for a 741 opamp:
i) CMRR ii) PSRR iii) Slew Rate. **(06 Marks)**

b. Derive an expression for the output voltage of non-inverting summing circuit. **(07 Marks)**

c. The difference of two input signals is to be amplified by a factor of 37. Each input has an amplitude of approximately 50 mV. Using LF353 opamp, design a difference amplifier to obtain approximately equal input resistance at the two input terminals and also provide common mode nulling. **(07 Marks)**

2 a. Using a BIFET opamp, design a capacitor coupled inverting amplifier with an input signal of 30 mV, a load resistance of 2.2 kΩ, A_V = 150 and f_l = 80 Hz. **(05 Marks)**

b. A high input impedance capacitor coupled non-inverting amplifier is to be designed using 741 opamp with A_V = 120, f_l = 100 Hz, input signal of 50 mV, and the load resistance ranging from 2.7 kΩ to 27 kΩ. **(09 Marks)**

c. Using 741 opamp with maximum input bias current of 500 nA, design a capacitor coupled voltage follower with a lower cutoff frequency of 120 Hz, and load resistance of 8.2 kΩ using +30V power supply. **(06 Marks)**

3 a. Discuss about the conditions that have to be fulfilled for an opamp circuit to oscillate. **(05 Marks)**

b. With the help of circuit schematic and frequency response, explain how phase lag compensation can be used to stabilize opamp circuit. **(05 Marks)**

c. Mention the need for Z_{in} MOD compensation. Discuss the role of compensating components in Z_{in} MOD compensation for an inverting amplifier. **(05 Marks)**

d. List the precautions to be observed for opamp circuit stability. **(05 Marks)**

4 a. Design a low resistance voltage source (with reference voltage derived from potential divider) to provide an output voltage of 8V. A 741 opamp with a ±15V supply is to be used, and the maximum output current is to be 60 mA. **(08 Marks)**

b. Determine the range of resistance of externally connected resistor R_G for a LH0036 IC instrumentation amplifier to give a voltage gain adjustable from 30 to 300. **(03 Marks)**

c. Design a precision full wave rectifier consisting of a summing circuit and a precision half wave rectifier to produce a 2V peak output from a sine wave input with peak value of 0.5 V and frequency of 1 MHz. Use bipolar opamps with a supply voltage of ±15V. **(09 Marks)**

PART – B

5 a. A ±5V, 10 kHz square wave from a signal source with a resistance of 100 Ω is to have its positive peak clamped precisely at ground level. Tilt on the output is not to exceed 1% of the peak amplitude of the wave. Design the precision clamping circuit using a supply of ±12V. **(08 Marks)**

b. Draw the fundamental circuit of logarithmic amplifier and derive an expression for output voltage. **(06 Marks)**

c. Design a wein bridge oscillator to have an output frequency of 15 kHz using a BIFET opamp with a supply voltage of ±12V. **(06 Marks)**

6 a. With a neat circuit diagram and associated waveforms explain the working principle of inverting Schmitt trigger circuit. **(05 Marks)**

b. Explain the working principle of astable multivibrator with a neat circuit schematic and waveforms. Specify the design procedure for this circuit. **(09 Marks)**

c. Using a 741 opamp, design a second order low pass filter with a cutoff frequency of 1 kHz. **(06 Marks)**

7 a. Discuss about the important characteristics of three terminal IC regulator. **(04 Marks)**

b. Draw the functional block diagram of IC723 voltage regulator and explain. **(06 Marks)**

c. With the help of circuit schematic explain the principle of operation of switched mode power supply. Mention its advantages. **(10 Marks)**

8 a. Draw the circuit diagram of monostable multivibrator using IC 555 and derive the expression for output pulse width. **(05 Marks)**

b. Give the basic block schematic of PLL and explain the function of each block. **(06 Marks)**

c. Draw the functional diagram of dual slope ADC and explain its working principle. Mention its advantages and limitations. **(09 Marks)**

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CBCS Scheme

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15EC33

Third Semester B.E. Degree Examination, June/July 2017
Digital Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Convert the given Boolean function into
i) $Y = f(a, b, c) = (a + b)(a + c)$ minterm canonical form **(04 Marks)**
ii) $P = f(a, b, c) = (a + b)(b + c)(\overline{c} + a)$ maxterm canonical form. **(04 Marks)**

b. Using K-map determine the minimal sum of product expression and realize the simplified expression using only NAND gates.
$M = f(W, X, Y, Z) = \sum (1, 4, 5, 6, 11, 12, 13, 14, 15)$. **(08 Marks)**

OR

2 a. Simplify the given Boolean function using Quine – McCluskey method :
$Y = f(a, b, c, d) = \sum (0, 2, 3, 5, 8, 10, 11)$. Verify the result using k-map. **(12 Marks)**

b. Distinguish between prime implicant and Essential prime implicant. **(04 Marks)**

Module-2

3 a. Define Decoder. Implement the following multiple output function using IC 74138 and external gates. Also write the truth table.
$P = f_1(X, Y, Z) = \sum (1, 2, 5, 6)$
$Q = f_2(X, Y, Z) = \pi (3, 5, 6, 7)$. **(06 Marks)**

b. Implement the following Boolean function using 8:1 multiplexer :
$Y = f(A, B, C, D) = \overline{A}B\overline{D} + ACD + \overline{B}CD + \overline{A}C\overline{D}$ **(10 Marks)**

OR

4 a. Design and implement 4-bit look ahead carry adder. **(08 Marks)**

b. Design and implement BCD to Excess-3 code converter. **(08 Marks)**

Module-3

5 a. Explain the working principle of gated SR latch. **(06 Marks)**

b. Explain the working of master slave JK flip-flop with the help of a logic diagram, function table, logic symbol and timing diagram. **(10 Marks)**

OR

6 a. With a neat logic diagram, explain the working of positive edge triggered D flip-flop. Also draw the timing diagram. **(08 Marks)**

b. Derive the characteristic equation for JK and T flip-flop. **(08 Marks)**

Module-4

7 a. Describe the working principle of universal shift register with the help of logic diagram and mode control table. **(08 Marks)**

b. Illustrate the operation of 4-bit binary ripple counter using logic diagram and timing diagram. **(08 Marks)**

OR

8 a. Design a synchronous Mod-6 counter using clocked T flip-flop. **(10 Marks)**

b. Explain Mod-4 ring counter using D flip-flop. **(06 Marks)**

Module-5

9 a. Explain Mealy and Moore sequential circuit models. **(04 Marks)**

b. For the logic diagram shown in Fig Q 9(b).

i) Write input and output equations

ii) Construct transition table

iii) Draw state diagram. **(12 Marks)**

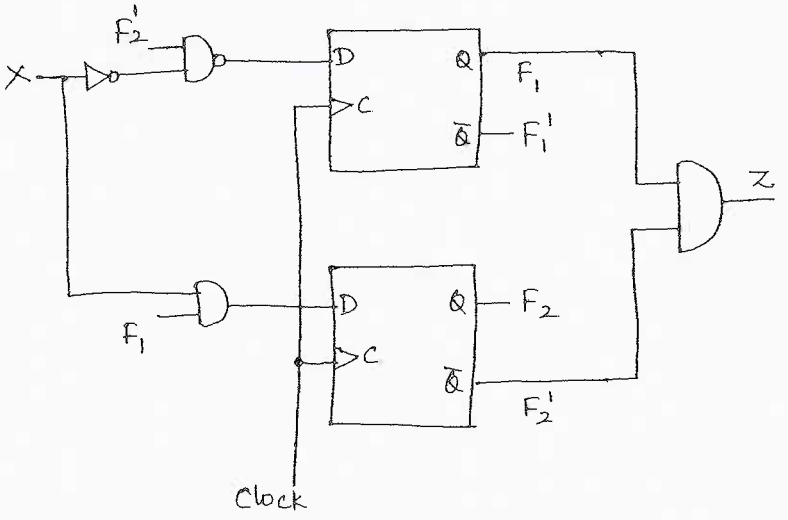

Fig Q9(b)

OR

10 a. Define the terms as applied to sequential circuit :
Input variable, output variable, Excitation variable and state variable. **(04 Marks)**

b. Design a sequential circuit for a state diagram shown in Fig Q 10(b). **(12 Marks)**

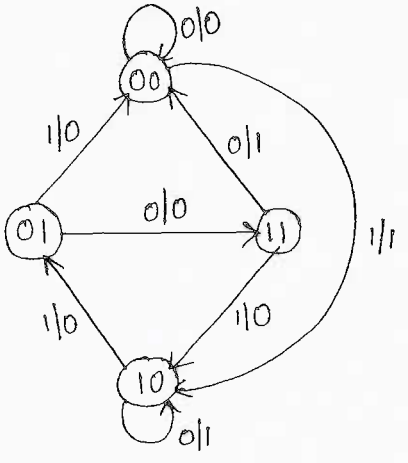

Fig Q10(b)

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CBCS Scheme

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15EC32

Third Semester B.E. Degree Examination, June/July 2017
Analog Electronics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Draw r_e and h-parameter models of a transistor in common -- emitter configuration. Also give relation between r_e and h-parameter **(05 Marks)**

b. Draw the emitter follower circuit. Derive expressions for i) Z_i ii) Z_0 iii) Av using r_e model. **(06 Marks)**

c. Draw and explain the hybrid-π model of transistor in CE configuration mentioning significance of each component in model. **(05 Marks)**

OR

2 a. Derive expressions for Z_i, Z_0, Av and A_I for common–emitter fixed bias configuration using hybrid equivalent model. **(08 Marks)**

b. For the circuit shown below, taking $r_0 = \infty\Omega$ calculate i) r_e ii) Z_i iii) Z_0 iv) Av. **(08 Marks)**

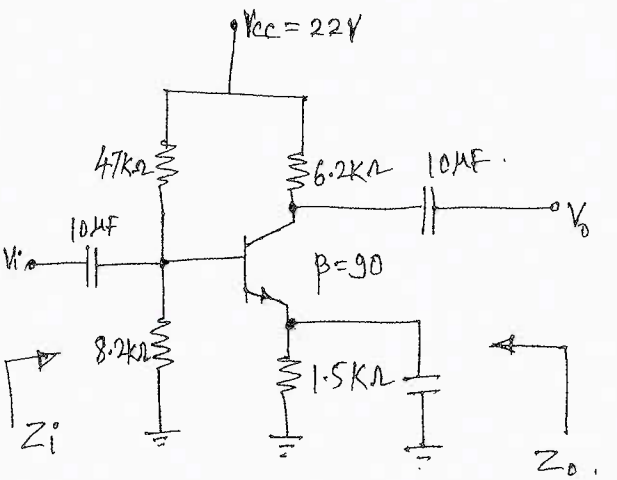

Fig.Q2(b)

Module-2

3 a. With circuit diagram of JFET small signal model, determine g_m and r_d. **(08 Marks)**

b. For the JFET common-source amplifier using fixed-bias configuration. Derive expressions for Z_i , Z_0 and Av using AC equivalent circuit. **(08 Marks)**

OR

4 a. For the JFET common-gate configuration shown below, calculate Z_i, Z_0 and Av. **(08 Marks)**

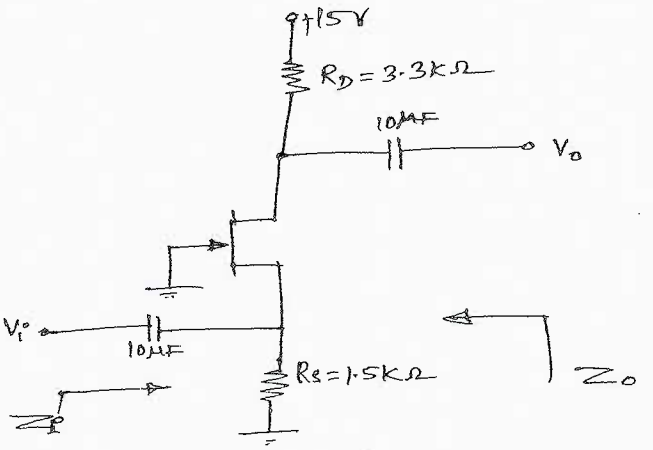

Fig.Q4(a)

b. With neat diagram, explain construction of n-channel JFET, and also draw its characteristics. **(08 Marks)**

Module-3

5 a. Describe Miller-effect and derive an equation for miller input and output capacitance. **(08 Marks)**

b. Discuss low frequency response of BJT amplifier and give expressions for low frequency due to input coupling capacitor C_S and output coupling capacitor C_C. **(08 Marks)**

OR

6 a. Explain high-frequency response of FET amplifier, and derive expression for cutoff frequencies defined by input and output circuits(f_{Hi} and f_{H0}). **(08 Marks)**

b. For the circuit shown.

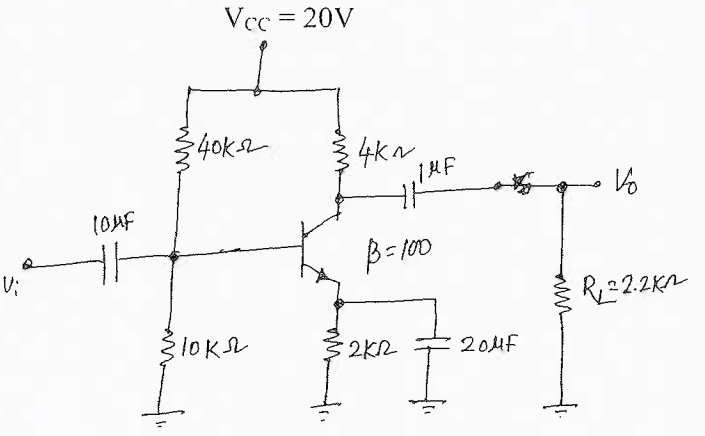

Fig.Q6(b)

$r_0 = \infty\Omega$, C_π(cbe) = 36pF, C_u (cbc) = 4pF, C_{ce} = 1 pF, C_{wi} = 6 pF, C_{w0} = 8pF

i) determine $f_{Hi}$and f_{H0}

ii) find f_β and f_T. **(08 Marks)**

Module-4

7 a. What is Barkhausen criterion? Explain how oscillations start in an oscillator. **(04 Marks)**

b. With the help of a neat circuit diagram, explain transistor colpitts oscillator. Write the expression for frequency of oscillations. **(08 Marks)**

c. A quartz crystal has L = 0.12H, C = 0.04 pF C_M = 1pF and R = 9.2 kΩ, Find :
i) series resonant frequency ii) Parallel resonant frequency. **(04 Marks)**

OR

8 a. Explain characteristics of a quartz crystal. With a neat diagram explain the crystal oscillator in parallel resonant mode. **(08 Marks)**

b. The following component values are given for the Wein-bridge oscillator of the circuit of $R_1 = R_2 = 33k\Omega$ $C_1 = C_2 = 0.001\mu F$ $R_3 = 47\ k\Omega$, $R_4 = 15k\Omega$.
i) Will this circuit oscillate?
ii) Calculate the resonant frequency. **(08 Marks)**

Module-5

9 a. Explain series – fed class – A power amplifier. Show that its maximum conversion efficiency is 25%. **(08 Marks)**

b. Explain with circuit diagram the operation of Class-B push-Pull amplifier using complementary--symmetry transistor pair. Also mention advantages and disadvantages of the circuit. **(08 Marks)**

OR

10 a. An ideal class –B push-pull power amplifier with input and output transformers has V_{CC} = 20V, $N_2 = 2N_1$ and $R_L = 20\Omega$. The transistors has h_{fe} = 20. Let the input be sinusoidal. For the maximum output signal at $V_{CE(P)} = V_{CC}$, determine :
i) The output signal power
ii) The collector dissipation in each transistor
iii) Conversion efficiency. **(08 Marks)**

b. The following distortion readings are available for a power amplifier,
$D_2 = 0.2$, $D_3 = 0.02$, $D_4 = 0.06$, with $I_1 = 3.3A$ and $R_C = 4\Omega$.
i) Calculate the total harmonic distortion
ii) Determine the fundamental power component
iii) Calculate the total power. **(08 Marks)**

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10ES33

Third Semester B.E. Degree Examination, June/July 2017
Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following (i) POS (ii) Truth table (iii) Karnaugh map. **(06 Marks)**

b. Find the minimal SOP of,

(i) $f(w,x,y,z) = \sum m(0,1,2,3,4,9,13) + dc(5,10,11,14)$

(ii) $f(w,x,y,z) = \pi M(0,3,4,11,13) + dc(2,6,8,9,10)$ **(07 Marks)**

c. Find the minimal sum and minimal product of,
$f(a,b,c,d) = \pi M(0,2,6,11,13,15) + dc(1,9,10,14)$ **(07 Marks)**

2 a. Obtain SOP using Quine-Mc Clusky method of,
$f(w,x,y,z) = \sum m(7,9,12,13,14,15) + dc(4,11)$ **(12 Marks)**

b. Simplify the function using VEM technique by considering a, b and c are map variables,
$f(a,b,c,d) = \sum m(2,3,4,10,13,14,15) + dc(7,9,11)$ **(08 Marks)**

3 a. Using AND decoder realize full adder with its truth table, output function and decoder of suitable type. **(06 Marks)**

b. Design 8 : 3 higher order priority encoder. Mention its advantage. **(08 Marks)**

c. Construct 16 : 1 MUX using 4 ; 1 MUX. **(06 Marks)**

4 a. Design 2 bit magnitude comparator with its truth table, simplified output equations and logic circuit. **(10 Marks)**

b. Realize and implement using 8 : 1 MUX where w, x, y appear as S_2,S_1 and S_0 of
$f(w,x,y,z) = \sum m(0,4,6,8,9,11,13,14)$
Also realize by 4 : 1 MUX where w, x appears as S_1, S_0. **(10 Marks)**

PART – B

5 a. Briefly explain sequential logic circuit. Explain TFF and JK Master Slave FF with their logic symbol, truth table, logic diagram and timing diagram. **(10 Marks)**

b. Explain race around condition and how it is over come. **(04 Marks)**

c. Explain the working of a SR latch as a switch debouncer with necessary circuit and timing diagram. **(06 Marks)**

6 a. Derive the characteristics equation of JK-FF and D-FF. **(06 Marks)**

b. With a neat diagram of 4-bit Universal Shift Register (USB) explain its working with the help of mode table. **(08 Marks)**

c. Design mod-10 asynchronous counter using clocked T-FFs. **(06 Marks)**

7 a. Explain 4-bit ring counter with a neat diagram. **(06 Marks)**

b. Explain the triggering of flipflops and its types. **(04 Marks)**

c. Design and implement a synchronous counter for the sequence 2 – 0 – 7 – 4 – 1 using negative edge clocked JK flip flop. **(10 Marks)**

8 a. Bring out the differences between Mealy and Moore machine models. **(08 Marks)**

b. Construct the excitation table, transition table, state table and state diagram for Moore circuit shown in Fig. Q8 (b). **(12 Marks)**

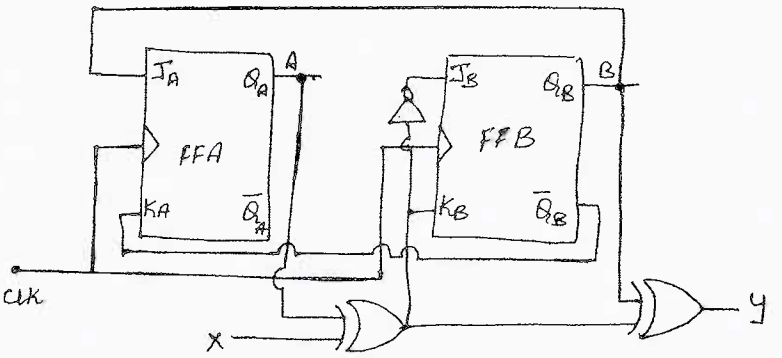

Fig. Q8 (b)

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10ES34

Third Semester B.E. Degree Examination, June/July 2017
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Calculate the current through 2Ω resistor in the network shown in Fig. Q1 (a) by source transformation method. **(06 Marks)**

b. Compute the resistance across the terminals A and B of the network shown in Fig. Q1(b) by star delta transformation. **(06 Marks)**

c. Use mesh analysis to determine what value of V_2 in the network shown in Fig. Q1(c). Cause voltage V = 0 across 20Ω resistor. **(08 Marks)**

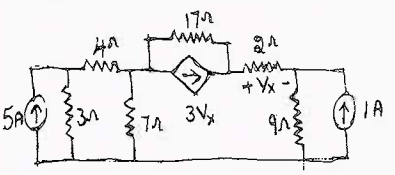

Fig. Q1(a)

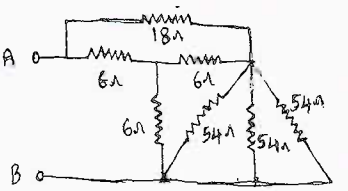

Fig. Q1(b)

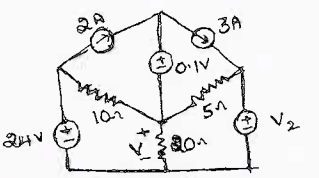

Fig. Q1(c)

2 a. Define with examples :
i) oriented graph ii) Tree iii) Cut set matrix iv) Tie set matrix. **(08 Marks)**

b. For the network shown in Fig. Q2(b) draw the graph. Select 2 and 4 as tree branches. Draw the tie set matrix. Write down the equilibrium equations with loop currents as variables. Solve these equations and find the various branch voltages and currents. The integers indicate branch numbers. Use matrix method. **(08 Marks)**

c. Draw the dual of the network shown in Fig. Q2(c). **(04 Marks)**

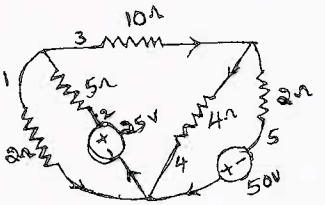

Fig. Q2(b)

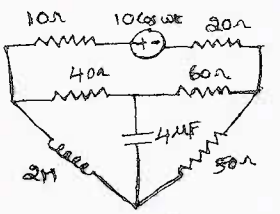

Fig. Q2(c)

3 a. Find V_a using superposition principle in the circuit shown in Fig. Q3(a). **(08 Marks)**

b. In the single current source circuit shown in Fig. Q3(b), find the voltge V_x. Interchange the current source and the resulting voltage V_x. Is the Reciprocity theorem verified? **(06 Marks)**

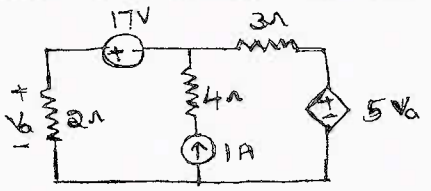

Fig. Q3(a)

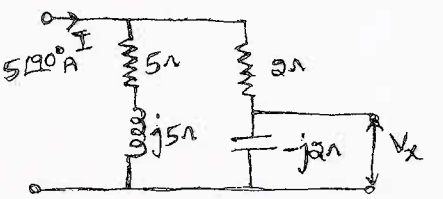

Fig. Q3(b)

c. State and explain Millman's theorem. **(06 Marks)**

4 a. For the network shown in Fig. Q4(a) , obtain the Thevinin's equivalent as seen from terminals p and q. **(08 Marks)**

b. Obtain Norton's equivalent circuit for the network shown in Fig. Q4(b). **(06 Marks)**

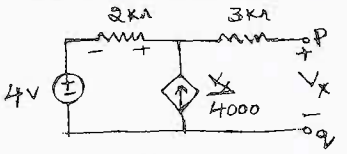

Fig. Q4(a)

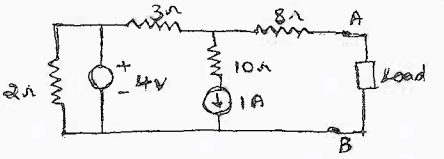

Fig. Q4(b)

c. Prove that an alternating voltage source transfers maximum power to a load when the load impedance is the conjugate of the source impedance. **(06 Marks)**

PART – B

5 a. Define quality factor and bandwidth. Also establish the relationship between them in a series resonance circuit. **(08 Marks)**

b. Show that resonant frequency of series resonance circuit is equal to the geometric mean of two half power frequencies. **(06 Marks)**

c. Find the value of R_L for which the circuit shown in Fig. Q5(c) is resonant. **(06 Marks)**

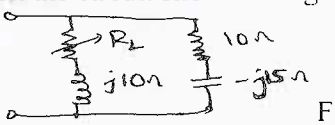

Fig. Q5(c)

6 a. Show that

i) The voltage of a capacitor cannot change instantaneously

ii) The current in an inductor cannot change instantaneously. **(10 Marks)**

b. In the circuit of Fig. Q6(b). Switch K is changed from 1 to 2 a t = 0 steady state having been attained in position 1. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t = 0. **(10 Marks)**

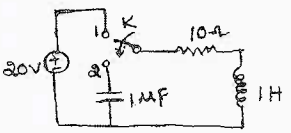

Fig. Q6(b)

7 a. State and prove i) Initial value theorem and ii) Final value theorem. **(10 Marks)**

b. Determine the response current i(t) in the circuit shown in Fig. Q7(b). Using Laplace transform. **(10 Marks)**

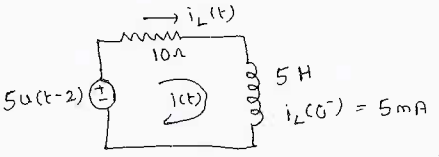

Fig. Q7(b)

8 a. Explain Z and Y parameters with equivalent circuit Also express Z parameters in terms of Y parameters. **(10 Marks)**

b. Obtain the Y parameters of the two port network shown in Fig. Q8(b). **(10 Marks)**

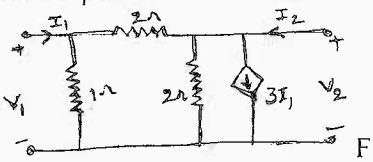

Fig. Q8(b)

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CBCS Scheme

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15EC34

Third Semester B.E. Degree Examination, June/July 2017
Network Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Calculate the current through 2Ω resistor for the circuit shown in Fig.Q1(a) using source transformation. **(08 Marks)**

b. Use mesh analysis to determine the three mesh currents I_1, I_2 and I_3 in the circuit shown in Fig.Q1(b). **(08 Marks)**

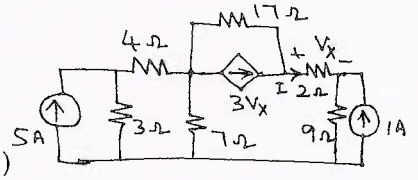

Fig.Q1(a)

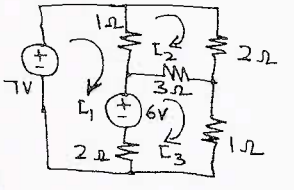

Fig.Q1(b)

OR

2 a. Find the equivalent resistance R_{AB} using star and delta transformation for network shown in Fig.Q2(a). **(08 Marks)**

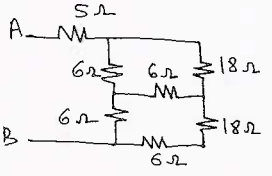

Fig.Q2(a)

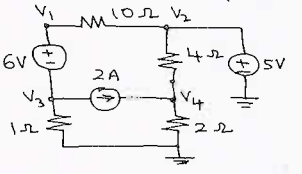

Fig.Q2(b)

b. For the circuit shown in Fig.Q2(b), determine all node voltages. **(08 Marks)**

Module-2

3 a. Using Millman's theorem, find the current through load resistance R_L for the circuit shown in Fig.Q3(a). **(08 Marks)**

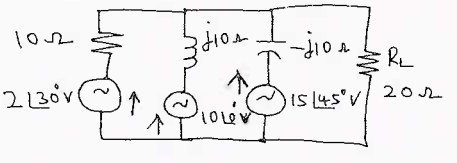

Fig.Q3(a)

b. State the maximum power transfer theorem and also prove that $P_{max} = \frac{V_{th}^2}{4R_L}$, where V_{th} = thevenins voltage. **(08 Marks)**

OR

4 a. Obtain the Thevenin's equivalent of the circuit shown in Fig.Q4(a). **(08 Marks)**

b. Using superposition theorem, find the current in 6Ω resistor in the network shown in Fig.Q4(b). **(08 Marks)**

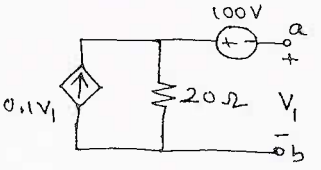

Fig.Q4(a)

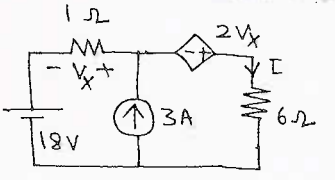

Fig.Q4(b)

Module-3

5 a. In the network shown in Fig.Q5(a), the switch is closed at t = 0, determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(08 Marks)**

b. For the network shown in Fig.Q5(b), the switch 's' is opened at t = 0 solve for V, DV and D^2V at $t = 0^+$. **(08 Marks)**

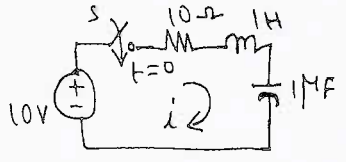

Fig.Q5(a)

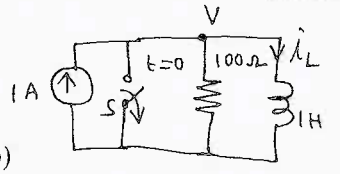

Fig.Q5(b)

OR

6 a. Find the Laplace transform of the periodic signal x(t) shown in Fig.Q6(a). **(08 Marks)**

b. Given the signal $x(t) = \begin{cases} 3, & t < 0 \\ -2 & 0 < t < 1 \\ 2t - 4 & t > 1 \end{cases}$

Express x(t) interms of singularity functions. Also find the Laplace transform of x(t). **(08 Marks)**

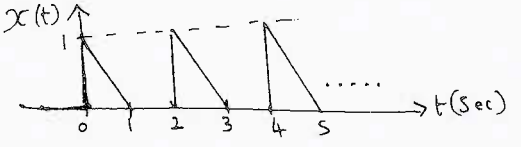

Fig.Q6(a)

Module-4

7 a. Derive the expressions of half power frequencies W_1 and W_2 and also bandwidth of a series resonance circuit. **(09 Marks)**

b. Find the values of L at which the circuit shown in Fig.Q7(b) resonates at a frequency of 500 r/s. **(07 Marks)**

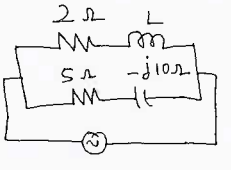

Fig.Q7(b)

OR

8 a. Derive the expressions of a resonance frequency and dynamic impedance of a parallel resonance circuit. **(09 Marks)**

b. A coil has a R = 20Ω, L = 80mH and C = 100pF are connected in series. Determine : i) impedance at resonance ii) resonance frequency iii) quality factor iv) circuit current if supply voltage is 50V. **(07 Marks)**

Module-5

9 a. Derive the expression of Z-parameters in term of h-parameter. **(07 Marks)**

b. Find the ABCD – parameters for the network shown in Fig.Q9(b). **(09 Marks)**

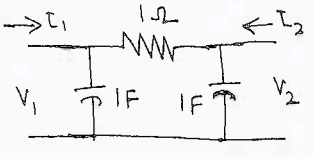

Fig.Q9(b)

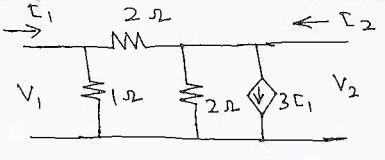

Fig.Q10(a)

OR

10 a. Find the Y-parameter for the two port network shown in Fig.Q10(a). **(08 Marks)**

b. Obtain the expression of h-parameters interms of Y-parameters. **(08 Marks)**

CBCS Scheme

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15EC35

Third Semester B. E Degree Examination, June/July 2017

Electronic Instrumentation

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Define types of static errors. How do you avoid them? **(06 Marks)**

b. Design a multi-range ammeter with range of 0 – 1A, 5A and 10A employing individual shunt in each A D'Arsonval movement with an internal resistance of 500Ω and a full scale deflection of 10mA is available. **(05 Marks)**

c. Define principle operation of thermocouple, and also explain types of thermocouple. **(05 Marks)**

OR

2 a. What is loading effect? **(02 Marks)**

b. Calculate series connected multiplier resistances with a D'Arsonval movement with an internal resistance of 100Ω and a full scale deflection of 10mA into a multirange dc voltmeter with ranges from 0-5V, 0-50V and 0-100V. **(04 Marks)**

c. Explain Differential voltmeter with circuit. **(05 Marks)**

d. Explain the working of a true RMS voltmeter with the help of a suitable block diagram. **(05 Marks)**

Module-2

3 a. With neat block diagram explain Dual slope integrating meter, and also derive the unknown voltage equation. **(08 Marks)**

b. An integrator contains a 100KΩ and 1μF capacitor, if the voltage applied to the integrator input is 1V, what voltage will be present at the output of the integrator after 1sec? **(02 Marks)**

c. With block diagram, explain principle operation of staircase ramp **(06 Marks)**

OR

4 a. With neat circuit diagram, explain basic frequency measurement operation. **(06 Marks)**

b. Explain with block diagram Digital phase meter operation. **(06 Marks)**

c. Define Tachometer and pH meter. **(04 Marks)**

Module-3

5 a. With neat circuit diagram explain time base generator with waveform. **(06 Marks)**

b. Explain in detail the working of digital storage oscilloscope and list advantages. **(10 Marks)**

OR

6 a. Explain with diagram conventional standard signal generator. **(08 Marks)**

b. Explain in detail the working of a function generator. **(08 Marks)**

Module-4

7 a. With circuit diagram explain Q – meter and its purpose. **(05 Marks)**

b. Self capacitance of a coil is measured, if the first measurement is at f_1 = 1MHz and C_1 = 500pf. The second measurement is at f_2 = 2MHz and C_2 = 110pf. Find the distributed capacitance also calculate the value of L. **(04 Marks)**

c. Define Megger instrument. With circuit diagram explain megger. **(07 Marks)**

OR

8 a. Define use of Maxwell's bridge. With circuit diagram derive and explain Maxwell's bridge equation. **(08 Marks)**

b. A wein bridge circuit consists of the following components R_1 = 4.7 KΩ, C_1 = 5nf, R_2 = 20KΩ, C_3 = 10nf, R_3 = 10KΩ, R_4 = 100KΩ. Determine the frequency of the circuit. **(02 Marks)**

c. Explain in detail with circuit Wagner's earth connection. **(06 Marks)**

Module-5

9 a. What are the factors to be considered for the selection of transducer? **(06 Marks)**

b. Explain principle operation of resistive position transducer. **(04 Marks)**

c. Explain resistive thermometer, list the advantages. **(06 Marks)**

OR

10 Briefly write a note on :

a. Strain gauges **(04 Marks)**

b. Differential output transducer **(04 Marks)**

c. Piezoelectrical transducer **(04 Marks)**

d. Semiconductor photo diode. **(04 Marks)**

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10IT35

Third Semester B.E. Degree Examination, June/July 2017
Electronic Instrumentation

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may be suitably assumed.

PART – A

1 a. What is systematic error? Explain the different types of systematic errors and how they can be avoided? **(08 Marks)**

b. The value of voltage across a resistor is 5V. The voltmeter reads as 4.95V. Calculate : i) Absolute error ii) % error iii) relative accuracy iv) % of accuracy. **(04 Marks)**

c. Draw the block diagram of a ture RMS voltmeter and explain the working. **(08 Marks)**

2 a. Discuss the operating and performance characteristics of digital voltmeter. **(04 Marks)**

b. With the help of block diagram and waveforms, explain the principle of operation of integrating type DVM which converts voltage to frequency. **(08 Marks)**

c. Draw the block diagram of a basic digital multimeter and explain the working. **(08 Marks)**

3 a. Write the basic CRO block diagram and explain the function of each of the blocks. **(08 Marks)**

b. Explain with waveforms the : i) ALTERNATE mode and ii) CHOP mode of operation in a dual trace oscilloscope. **(08 Marks)**

c. What is the function of electronic switch? Explain with basic block diagram. **(04 Marks)**

4 a. What is the need of delayed time Basic system? Explain. **(04 Marks)**

b. With the help of block diagram and waveforms explain the working of a sampling oscilloscope. **(10 Marks)**

c. Discuss the applications of digital storage oscilloscope. **(06 Marks)**

PART – B

5 a. Draw the block diagram of AF sine and square wave generator and explain its working in detail. **(08 Marks)**

b. Explain the principle of operation of frequency synthesizer using PLL system. **(08 Marks)**

c. Describe briefly the sweep frequency generator. Also mention its applications. **(04 Marks)**

6 a. What are the limitations of wheat-stone bridge? **(04 Marks)**

b. Given a centre zero (200 – 0 – 200) MA movement having an internal resistance of 125Ω. Calculate the current through the galvanometer by the approximate method for the wheat-stones bridge with four arms as 700Ω, 700Ω 700Ω and 735Ω, and E = 10V. **(06 Marks)**

c. A Maxwell bridge is used to measure inductance. The bridge constants at balance are : Find the series equivalent of the unknown impedance. Derive the relations used. **(10 Marks)**

7 a. What are the main advantages of electrical transducers? Explain in brief. **(04 Marks)**

b. Discuss the construction of semiconductor strain gage and list the advantages and disadvantages **(08 Marks)**

c. Explain the principle of operation of LVDT with the help of neat sketch. **(08 Marks)**

8 a. With circuit diagram and characteristics, explain the principle of operation of photo-transistor. **(08 Marks)**

b. Write a note on classification of displays. **(04 Marks)**

c. With a neat diagram, explain the measurement of RF power using bolometer bridge. **(08 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

CBCS Scheme

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15EC36

Third Semester B.E. Degree Examination, June/July 2017
Engineering Electromagnetics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. State vector form of Coloumb's law of force between two point charges and indicate the units of the quantities in the equation. **(04 Marks)**

b. Let a point charge $Q_1 = 25nC$ be located at A(4, −2, 7) and charge $Q_2 = 60nC$ be at B(−3, 4, −2). Find $\vec{E}$ at C(1, 2, 3) and find the direction of $\vec{E}$. **(10 Marks)**

c. Define electric field intensity due to number of point charge in a vector form. **(02 Marks)**

OR

2 a. Derive an expression for the electric field intensity due infinite line charge. **(06 Marks)**

b. Define electric flux density. Find $\vec{D}$ in Cartesian co-ordinate system at a point p(6, 8, −10) due to a point charge of 40mC at the origin and a uniform line charge of $\rho_L = 40\mu C/m$ on the z-axis. **(10 Marks)**

Module-2

3 a. State and prove Gauss law as applied to an electric field. **(06 Marks)**

b. Given that $\vec{A} = 30e^{-r}\hat{a}_r - 2z\hat{a}_z$ in the cylindrical co-ordinates. Evaluate both sides of the divergence theorem for the volume enclosed by r = 2, z = 0 and z = 5. **(10 Marks)**

OR

4 a. Define the electric scalar potential. Derive an expression for potential due to point charge. **(06 Marks)**

b. A point charge of 6nC is located at the origin in free space find potential of point P if P is located at (0.2, −0.4, 0.4) and i) V =0 at infinity ii) V = 0 at (1, 0, 0) iii) V = 20V at (−0.5, 1, −1). **(10 Marks)**

Module-3

5 a. Starting with point form of Gauss law deduce Poisson's and Laplace's equation. **(03 Marks)**

b. State and Prove uniqueness theorem **(05 Marks)**

c. Find V at (2, 1, 3) for the field of
   i) 2 co-axial conducting cylinders V = 20V at ρ = 3m
   ii) 2 concentric conducting spheres V = 50V at r = 3m and V = 20V at r = 5m. **(08 Marks)**

OR

6 a. State and explain Biot – Savart's law. **(04 Marks)**

b. Evaluate both sides of the Stoke's theorem for the field $\vec{H} = 6xy\hat{a}_x - 3y^2\hat{a}_y$ A/m and the rectangular path around the region, $2 \le x \le 5, -1 \le y \le 1, z = 0$. Let the positive direction of $\vec{ds}$ be $\hat{a}_z$. **(08 Marks)**

c. At a point p(x, y, z) the components of vector magnetic potential $\vec{A}$ are given as $A_x = 4x + 3y + 2z$, $A_y = 5x + 6y + 3z$ and $A_z = 2x + 3y + 5z$. Determine $\vec{B}$ at point P. **(04 Marks)**

Module-4

7 a. A point charge of $Q = -1.2C$ has velocity $\vec{V} = (5\hat{a}_x + 2\hat{a}_y - 3\hat{a}_z)$ m/s. Find the magnitude of the force exerted on the charge if

i) $\vec{E} = -18\hat{a}_x + 5\hat{a}_y - 10\hat{a}_z$ V/m

ii) $\vec{B} = -4\hat{a}_x + 4\hat{a}_y + 3\hat{a}_z$ T

iii) Both are present simultaneously. **(08 Marks)**

b. Derive an expression for the force on a differential current element placed in a magnetic field. **(04 Marks)**

c. A conductor 4m long lies along the y-axis with a current of 10.0A in the $\hat{a}_y$ direction. Find the force on the conductor if the field in the region is $\vec{B} = 0.005\hat{a}_x$ T. **(04 Marks)**

OR

8 a. If $\vec{B} = 0.05x\hat{a}_y$ T in a material for which $\chi_m = 2.5$. Find

i) μ_r ii) μ iii) $\vec{H}$ iv) $\vec{M}$ v) $\vec{J}$ vi) $\vec{J}_b$ **(08 Marks)**

b. Write a on magnetic circuits **(04 Marks)**

c. Write a note on forces on magnetic materials. **(04 Marks)**

Module-5

9 a. Explain Displacement current density and conduction current density. **(04 Marks)**

b. List Maxwell's equations for steady and time varying fields in
i) Point form ii) Integral from. **(06 Marks)**

c. Do the fields $\vec{E} = E_m \sin x \sin t\,\hat{a}_y$ and $\vec{H} = \frac{E_m}{\mu_o}\cos x \cos t\,\hat{a}_z$ satisfy Maxwell's equations? **(06 Marks)**

OR

10 a. What is Forward travelling wave and Backward travelling wave in free space? **(02 Marks)**

b. A uniform plane wave in free space is given by $E_s = 200\,\underline{|30^\circ} \cdot e^{-j250z}\,\hat{a}_x$ V/m.

Find β, w, f, λ, η, $|\vec{H}|$ **(06 Marks)**

c. State and prove Poynting theorem **(08 Marks)**

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10ES36

Third Semester B.E. Degree Examination, June/July 2017

Field Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Drive the expression for electric field intensity [EFI] due to infinite line charge. **(08 Marks)**

b. A point charge $Q_1 = 25$ nc is located at $P_1(4, -2, 7)$ and a charge $Q_2 = 60$ nc is at $P_2(-3, 4, 2)$, if $\epsilon = \epsilon_0$, find: i) $\overline{E}$ at $P_3(1, 2, 3)$ and (ii) At which point on the 'y' axis is $E_x = 0$? **(06 Marks)**

c. A cube is defined by $1 < x, y, t < 1.2$. If $\overline{D} = 2x^2y\,\overline{ax} + 3x^2y^2\,\overline{ay}$ c/m^2.

i) Apply Gauss's law to find the total flux leaving the closed surface of the cube.

ii) Evaluate $\nabla \cdot \overline{D}$ at the centre of the cube.

iii) Estimate the total charge enclosed within the cube. **(06 Marks)**

2 a. Find the workdone in moving a charge of +2C from (2, 0, 0)m to (0, 2, 0)m along the straight line path joining the two points. If the electric field is $\overline{E} = 2x\,\overline{ax} - 4y\,\overline{ay}$ V/m. **(08 Marks)**

b. Prove that $\overline{E} = -\nabla V$. **(06 Marks)**

c. A potential field in free space is expressed as $V = \frac{20}{xyz}$ volts.

i) Find the total energy shred within the cube $1 < x, y, z < 2$.

ii) What value of the energy would be obtained by assuming a uniform energy density equal to the value at the centre of the cube? **(06 Marks)**

3 a. Let $\epsilon = \epsilon_0$, and $V = 90\ Z^{\frac{4}{3}}$ in the region $z = 0$.

i) Obtain expression for $\overline{E}$, $\overline{D}$ and ρv as function of $\overline{Z}$.

ii) If the velocity of charge density is given as $V_z = 5 \times 10^{-6}\ Z^{\frac{2}{3}}$ m/s. Find I_z at $z = 0$ and $z = 0.1$ m. **(06 Marks)**

b. Derive boundary condition at a boundary between two dielectric medium. **(08 Marks)**

c. Determine whether or not the following potential fields satisfy the Laplace equation:

i) $V = x^2 - y^2 + z^2$ ii) $V = r\cos\phi + z$ **(06 Marks)**

4 a. Find the magnetic field intensity ($\overline{H}$) due to straight conductor of finite length using Biot-Savart law. **(06 Marks)**

b. Using Biot-Savart law, find the value of $\overline{H}$ at that point p for the current circuit shown in Fig.Q4(b).

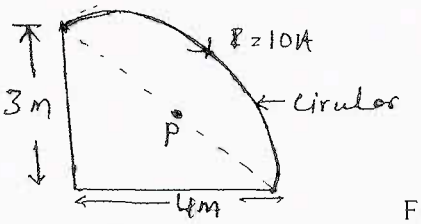

Fig.Q4(b) **(06 Marks)**

c. Define and derive expression for scalar magnetic potential and vector magnetic potential. **(08 Marks)**

PART – B

5 a. Explain force between differential current elements. **(06 Marks)**

b. Explain the magnetic boundary conditions. **(08 Marks)**

c. Define self inductance. Derive expression for the inductance of a co-axial cable. **(06 Marks)**

6 a. Derive Maxwell's equation in vector differential form for time varying field starting from Faraday's law. **(06 Marks)**

b. Derive an expression for general wave equation in free space. **(08 Marks)**

c. An uniform plane of 1 MHz is propagating in medium for which $\sigma = 5.8 \times 10^7$ $\mho$/m and $\epsilon_r = \mu_r = 1$. Find the following:

i) Attenuation constant

ii) Phase shaft constant

iii) Velocity

iv) Wavelength **(06 Marks)**

7 a. State and prove Poynting theorem. **(10 Marks)**

b. The region $Z < 0$ is characterized by $\epsilon'_R = \mu_R = 1$ and $\epsilon''_R = 0$. The total $\overline{E}$ filed here is given as the sum of the two uniform plane waves: $E_S = 150e^{-J10z}\overline{ax} + (50\underline{|20})e^{J10z}ax$ V/m.

Find:

i) What is the operating frequency?

ii) Specify the intrinsic impendence of the region $Z > 0$ that would provide the appropriate reflected wave.

iii) At what value of Z(-10cm < z < 0) is the total electric field intensity a maximum amplitude? **(10 Marks)**

8 a. Define SWR and derive the expression for SWR in term of reflection coefficient. **(10 Marks)**

b. Explain reflection of uniform plane waves at normal incidence. derive the expressions for transmission and reflection coefficient. **(10 Marks)**

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10ES42

Fourth Semester B.E. Degree Examination, June/July 2017
Microcontrollers

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Give comparison between microprocessor and microcontroller. **(06 Marks)**

b. Explain with neat diagram, Harvard architecture and Van-Neumann architecture. **(06 Marks)**

c. With the help of block diagram, list the specific features of 8051 microcontroller. **(08 Marks)**

2 a. Explain the following instructions with suitable examples:
i) MOVX A, @dptr ii) ACALL Target iii) DJNZ R1, up **(06 Marks)**

b. Differentiate between jump and CALL instructions. **(06 Marks)**

c. Write an assembly language program with comments using 8051 mnemonics to convert ASCII to hexadecimal. **(08 Marks)**

3 a. Briefly explain the different assembler directives used in an assembly language program. **(04 Marks)**

b. Write an ALP to find the number of negative and positive numbers in a given array of ten bytes of data. The number is available from memory location 8000 h. **(08 Marks)**

c. Write an 8051 software time delay subroutine to generate a time delay of 1 second when called. Assume crystal frequency as 11.0592 MHz. Show delay calculations. Do not use timers? **(08 Marks)**

4 a. Explain with a diagram, how the DAC 0808 can be interfaced to 8051 microcontroller. Write an 8051 C program to create the triangular wave. **(10 Marks)**

b. With a neat diagram show how a stepper motor is interfaced to 8051. Write a program to rotate it continuously. **(10 Marks)**

PART – B

5 a. Differentiate between a counter and timer. Explain the timer modes of operation in 8051. **(04 Marks)**

b. Assuming that XTAL = 11.0592 MHz, write a program to generate a square wave of 2 kHz frequency on pin P1.5. Use timer 1 and mode 1 operation. Duty cycle = 50%. **(08 Marks)**

c. Explain TMOD and TCON registers with its bit pattern. **(08 Marks)**

6 a. Explain briefly the interrupts of 8051, indicate their vector addresses. **(05 Marks)**

b. Explain the format of SCON register in details. **(05 Marks)**

c. Write a program with proper comments to transfer the message "YES" serially at 9600 baud rate, 8 bit data, 1 stop bit. Do this continuously. **(10 Marks)**

7 a. Write the steps required for programming 8051 to receive data serially. **(08 Marks)**

b. With a block schematic, explain the features of 8255 PPI chip and its mode of operation. **(06 Marks)**

c. What is the need for serial communication? Explain half duplex and full duplex transmission. **(06 Marks)**

8 a. Explain the architecture of MSP 430 CPU with its internal block schematic. **(10 Marks)**

b. Mention the features and functions of the watch-dog timer and explain. **(10 Marks)**

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10ES43

Fourth Semester B.E. Degree Examination, June/July 2017
Control System

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Graph and semi log required.

PART – A

1 a. Write down the differential equations governing the system below and write the force voltage analogy circuit. **(10 Marks)**

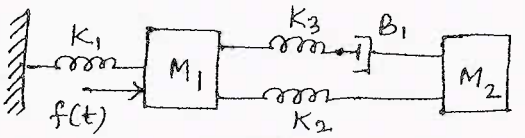

Fig.Q1(a)

b. For the Fig.Q1(b). Derive the expression for the TF : $\frac{Q_1(s)}{T_1(s)} = \frac{1}{s(s^2 J_{eq} + B_{eq})}$. **(10 Marks)**

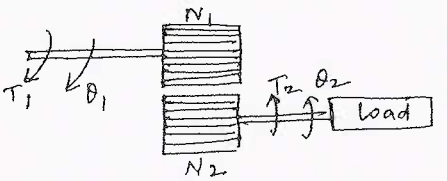

Fig.Q1(b)

2 a. Find the TF of the system by using block diagram reduction method. **(10 Marks)**

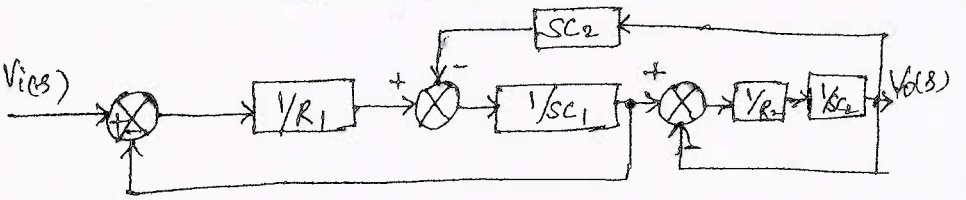

Fig.Q2(a)

b. Find the C/R for the following system using Mason's gain formula. **(10 Marks)**

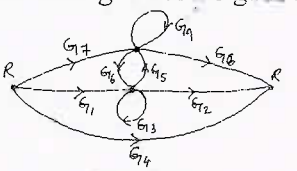

Fig.Q2(b)

3 a. Give the definition for the following transient response of a control systems to a unit step input interms of time domino specifications.
i) Delay time, t_d ii) Rise time, t_r iii) Peak time, t_p iv) Maximum overshoot Mp v) Settling time, t_s with equations. **(10 Marks)**

b. A closed loop servo is represented by the differential equation : $\frac{d^2c}{dt^2} + \frac{8dc}{dt} = 64e$ where 'c' is the displacement of the output Shaft 'r' is the displacement of the input shaft and e = r – c, determine undamped natural frequency, damping ratio. **(10 Marks)**

10ES43

4 a. A system with oscillating frequency w, if it has poles at s = ±jw, no poles to the right half of the S plane. Determine the value of 'K' and so that the system is shown below oscillates at a frequency of 2 rad/sec. **(10 Marks)**

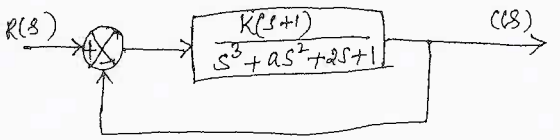

Fig.Q4(a)

b. The open loop transfer function of servo system with unity feedback is $G(s) = \frac{10}{s(0.1s+1)}$. Evaluate the static error constant of the system. Obtain the steady – state error of the system, when subjected to an input given by the polynomial $r(t) = a_0 + a_1 t + \frac{a_2}{2} t^2$. **(10 Marks)**

PART – B

5 For a unity feedback system the open–loop transfer function is given by :

$$G(s) = \frac{k}{s(s+2)(s^2+6s+25)}$$

i) Sketch the root locus for $0 \le k \le \infty$
ii) At what value of K the system becomes unstable?
iii) At this point of instability, determine the frequency of oscillation of the system.

(20 Marks)

6 Sketch the Nyquist plot for the open loop transfer function :

$G(s)H(s) = \frac{10}{(s+2)(s+4)}$. Determine the stability of the closed loop system by Nyquist criterion. **(20 Marks)**

7 The open loop transfer function of unity feedback system is : $G(s) = \frac{K}{s(s+1)(s+10)}$.

Draw the Bode plot and determine :
i) Limiting value of K for the system to be stable
ii) The value of 'K' for gain margin of 7dB
iii) The value of K for phase margin of 40° $G(s) = \frac{k}{s(s+1)(s+10)}$. **(20 Marks)**

8 a. Write the state equation for the network shown : **(10 Marks)**

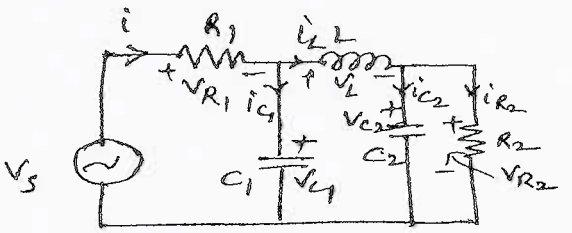

Fig.Q8()

b. Obtain the characteristic equation of the matrix :

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}.$$ **(10 Marks)**

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10EC44

Fourth Semester B.E. Degree Examination, June/July 2017

Signals and Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the classification of signals with example. **(07 Marks)**

b. Derive an expression to find even and odd components of continuous time signal. **(04 Marks)**

c. For the CTS x(t) shown in Fig.Q1(c), sketch (i) x(3t + 2), (ii) x(3t) + x(3t + 2).

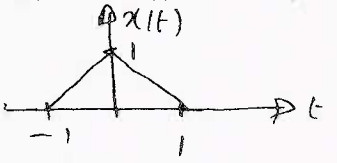

Fig.Q1(c) **(04 Marks)**

d. Determine whether following signals are periodic or not, if periodic find the fundamental period. (i) $x(t) = \{\cos(2\pi t)\}^2$, (ii) $x(n) = \cos 2n$. **(05 Marks)**

2 a. Verify whether the following system is linear, time invariant, memoryless, causal and stable $y(t) = at^2x(t) + bt\,x(t-4)$. **(07 Marks)**

b. Compute the convolution of $x_1(n) = \{\underset{\uparrow}{2}, 3, 4\}$ and $x_2(n) = \{1, \underset{\uparrow}{2}, 3, 4\}$. **(03 Marks)**

c. Compute the convolution of the following : $x(t) = e^{-4t}[u(t) - u(t-2)]$, $h(t) = e^{-2t}u(t)$. **(10 Marks)**

3 a. Find the step response for the LTI system represented by impulse response $h(u) = \left(\frac{1}{4}\right)^n u(n)$. **(03 Marks)**

b. Find the forced response of the system given by $5\frac{dy}{dt} + 10y(t) = 2x(t)$ with $x(t) = 2u(t)$. **(05 Marks)**

c. Find the response of the system described by the difference equation $y(n) - \frac{1}{9}y(n-2) = x(n-1)$ with $y(-1) = 1$, $y(-2) = 0$ and $x(n) = U(n)$. **(07 Marks)**

d. Draw the direct from I and direct form II implementation for $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 5y(t) = \frac{dx(t)}{dt}$. **(05 Marks)**

4 a. Prove the following properties of DTFS:
i) Convolution in time domain
ii) Modulation theorem. **(08 Marks)**

b. Determine the DTFS coefficients of $x(n) = \cos\left(\frac{6\pi}{13}n + \frac{\pi}{6}\right)$. Draw magnitude and phase spectrum. **(06 Marks)**

c. Determine the time domain signal corresponding to the following spectra:

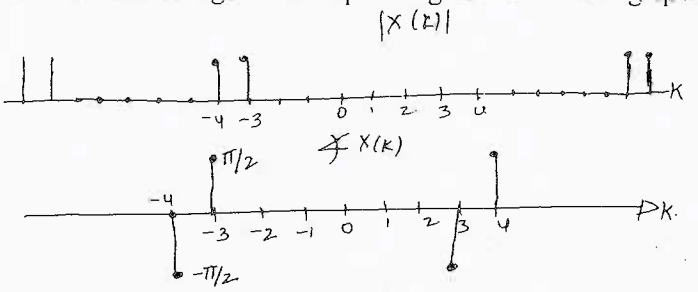

Fig.Q4(c) **(06 Marks)**

PART – B

5 a. Prove time property of discrete time aperiodic sequences. **(03 Marks)**

b. Determine DTFT of $x(n) = a^n u(n)$ and plot magnitude and phase plot. **(05 Marks)**

c. Determine the time domain expression of :

i) $X(e^{j\Omega}) = \dfrac{3 - \frac{1}{4}e^{-j\Omega}}{-\frac{1}{16}e^{-j2\Omega} + 1}$

ii) $X(e^{j\Omega}) = \dfrac{6}{e^{-j2\Omega} - 5e^{-j\Omega} + 6}$

iii) $X(e^{j\Omega}) = \dfrac{6 - \frac{2}{3}e^{-j\Omega} - \frac{1}{6}e^{-j2\Omega}}{-\frac{1}{6}e^{-j2\Omega} + -\frac{1}{6}e^{-j\Omega} + 1}$ **(12 Marks)**

6 a. A causal and LTI system has frequency response. $H[j\omega] = H[\omega] = \dfrac{j\omega + 4}{6 - \omega^2 + 5j\omega}$.

i) Obtain the differential equation for the system.

ii) Determine the impulse response h(t) of s.

iii) What is the output of s if $x(t) = e^{-4t}u(t) - te^{-4t}u(t)$? **(10 Marks)**

b. The input and output of a causal LTI system are related by differential equation:

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$$

i) Find h(t).

ii) Find the response of the system for $x(t) = t \cdot e^{-2t}u(t)$. **(10 Marks)**

7 a. Prove the time shifting and differentiation properties of z-transform. **(06 Marks)**

b. Determine the z-transform and ROC of the following sequence $x(n) = -a^n u(-n-1)$. **(04 Marks)**

c. Find the inverse z-transform of $X(z) = \dfrac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$ for (i) $|z| > 1$, (ii) $|z| < 0.5$. **(10 Marks)**

8 a. A causal system has input x(n) and output y(n). Find the impulse response of the system:

$x(n) = \delta(n) + \frac{1}{4}\delta(n-1) - \frac{1}{8}\delta(n-2)$; $y(n) = \delta(n) - \frac{3}{4}\delta(n-1)$ **(10 Marks)**

b. Solve the difference equation for the given initial conditions and input using unilateral z-transform. $y(n) - \frac{1}{9}y(n-2) = x(n-1)$ with $y(-1) = 0$, $y(-2) = 1$ and $x(n) = 3u(n)$. **(10 Marks)**

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CBCS Scheme

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15EC45

Fourth Semester B.E. Degree Examination, June/July 2017

Principles of Communication Systems

Time: 3 hrs. Max. Marks: 80

Note: Answer FIVE full questions, choosing one full question from each module.

Module-1

1 a. Explain with the help of a neat sketch and analysis, how switching modulator is used to generate amplitude modulation. **(06 Marks)**

b. Explain how Costas receiver can be used for demodulating the DSB-SC signal. **(06 Marks)**

c. Consider a message signal m(t) containing frequency components at 100, 200 and 400 Hz. This signal is applied to an SSB modulator together with a carrier at 100 kHz, with only the upper sideband retained. In the coherent detector used to recover m(t), the local oscillator supplies a sine wave of frequency 100.02 kHz.

i) Determine the frequency components of the detector output.

ii) Repeat the analysis assuming that only the lower sideband is transmitted. **(04 Marks)**

OR

2 a. Explain the operation of envelope detector with neat diagrams and waveforms. Bring out the significance of the RC time constant of the circuit in detection of the message signal without distortion. **(06 Marks)**

b. Derive an expression for SSB modulated wave for which upper side band is retained. **(06 Marks)**

c. Using the message signal $m(t) = \frac{1}{1+t^2}$, determine and sketch the modulated wave for amplitude modulation with the following values. (i) μ = 50%, (ii) 100%. **(04 Marks)**

Module-2

3 a. Derive the equation for frequency modulated wave. Define modulation index, maximum deviation of a frequency modulated signal. **(06 Marks)**

b. Explain generation of frequency modulated signal using direct method. **(05 Marks)**

c. The equation for a FM wave is $s(t) = 10\sin[5.7\times10^{8}t + 5\sin 12\times10^{3}t]$. Calculate :

i) Carrier frequency

ii) Modulating frequency

iii) Modulation index

iv) Frequency deviation

v) Power dissipated in 100Ω **(05 Marks)**

OR

4 a. With neat circuit diagram, explain FM demodulation using balanced slope detector. **(06 Marks)**

b. With relevant block diagram, explain FM stereo multiplexing. **(05 Marks)**

c. Explain the linear model of phase locked loop (PLL). **(05 Marks)**

Module-3

5 a. What is conditional probability? Prove that $P(B/A) = \frac{P(A/B) \cdot P(B)}{P(A)}$. **(05 Marks)**

b. With an example, explain what is meant by statistical averages. **(06 Marks)**

c. Define white noise. Plot power spectral density (PSD) and autocorrelation function (ACF) of white noise. **(05 Marks)**

OR

6 a. What do you mean by probability density function? Prove that the total volume under the surface of a probability density function (pdf) is always 1. **(05 Marks)**

b. Define mean, autocorrelation and auto-covariance function. **(06 Marks)**

c. What is noise equivalent band width? Derive an expression for the same. **(05 Marks)**

Module-4

7 a. With relevant equations, explain how noise is produced in a receiver model. **(08 Marks)**

b. Show that the figure-of-merit for DSB-SC system is unity. **(08 Marks)**

OR

8 a. Derive the expression for figure-of-merit of an AM receiver. **(08 Marks)**

b. Explain pre-emphasis and de-emphasis in frequency modulation (FM). **(08 Marks)**

Module-5

9 a. State sampling theorem for band limited signals. Explain the process of sampling. **(07 Marks)**

b. With neat block diagram, explain the generation of pulse-position modulation (PPM) waves. **(05 Marks)**

c. Twelve different message signals, each with a bandwidth of 10 kHz are to be multiplexed and transmitted. Determine the minimum bandwidth required for each method if the multiplexing/modulation method used is (i) FDM, SSB; (ii) TDM, PAM. **(04 Marks)**

OR

10 a. With relevant diagram, explain the generation and reconstruction of pulse code modulation (PCM) signal. **(06 Marks)**

b. With neat diagram, explain the concept of time division multiplexing (TDM). **(06 Marks)**

c. Determine the Nyquist rate and the Nyquist interval for :

(i) $g(t) = \sin c(200t)$ (ii) $m(t) = \frac{1}{\pi t}[\sin(500\pi t)]$. **(04 Marks)**

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10EC45

Fourth Semester B.E. Degree Examination, June/July 2017
Fundamentals of HDL

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

PART – A

1 a. Explain in brief verilog data types and operators with example. **(11 Marks)**

b. List different modeling styles. Define significances of each modeling style. **(06 Marks)**

c. Find the value of expression X_1, X_2, X_3 for the following VHDL signal declaration,

```
Signal a : bit : = '1' ;
Signal b : bit – vector (3 down to 0) : = "1010";
Signal c : bit – vector (0 to 3) : = "0010" ;
X1 = C sll 2
X2 = b sra 3
X3 = a b(2) c(1)
```

(03 Marks)

2 a. Design a 4 : 1 Mux and implement the same using Boolean equation in verilog. **(05 Marks)**

b. Design 3×3 unsigned combinational array multiplier in VHDL assigning a delay 5 ns. **(10 Marks)**

c. Write a verilog description for a SR latch: (i) Use a characteristic equation. (ii) Use two logic gates. **(05 Marks)**

3 a.
```
architecture sig of dummy is
Signal trigger, sum : integer : = 0 ;
Signal Sig 1 : integer : = 1 ;
Signal Sig 2 : integer : = 2 ;
Signal Sig 3 : integer : = 3 ;
begin
        process (trigger)
          begin
              Sig 1 <= Sig2 + Sig3 ;  Sig2 <= Sig1 ;
              Sig 3 <= Sig2 ;  Sum <= Sig1 + Sig2 + Sig3 ;
          end process; eng Sig ;
architecture Var of dummy is
Signal trigger, Sum : integer : = 0;
Begin
        Process (trigger)
        Variable Var 1 : integer : = 1 ;
        Variable Var 2 : integer : = 2 ;
        Variable Var 3 : integer : = 3 ;
        Begin
              Var1 : = Var2 + Var3 ;  Var 2 : = Var 1;
              Var3 : = Var2 ;  Sum <= Var1 + Var2 + Var3 ;
        end process ; end Var ;
```

The trigger value changes at t = 10 ns, the statements are executed only once.

Evaluate the value of sum at t = 10 nS + Δ for above 2 cases. **(06 Marks)**

b. Design 4-bit ripple adder using for loop only and implement the same using VHDL. **(07 Marks)**

c. Write a behavioral description in verilog for JK flip flop using if and else if statement only. With active low clock and asynchronous reset. **(07 Marks)**

4 a. Design a 3-bit synchronous even counter using D flip flop with active high hold and implement the same in structural description in verilog. **(10 Marks)**

b. Write the HDL programs for N+1 bit magnitude comparator using,

(i) Generate and generic in VHDL.

(ii) Generate and Parameter in verilog. **(10 Marks)**

PART – B

5 a. Write a code to convert integer to signed Binary (4 – bit) using procedure. **(08 Marks)**

b. Bring out the difference between procedure and function with an example. **(07 Marks)**

c. Write a note on verilog file processing. **(05 Marks)**

6 a. Write the block diagram and function table of a SRAM, using this write VHDL description of 16×8 SRAM. **(08 Marks)**

b. Package array is

```
    Constant P : integer : = 2 ;
    Constant N : integer : = 2 ;
    Constant M : integer : = 1 ;
Subtype wordg is integer ;
type Single 1 is array (P downto 0) of wordg ;
type Single 2 is array (N downto 0) of Single 1 ;
type arry 3 is array (M downto 0) of single 2 ;
end array;
library IEEE;
Use IEEE.STD-LOGIC-1164.ALL;
Use work.arry.all;
Entity Ex is
    Part (N, M, P: integer ; z : out integer);
End Ex;
Architecture Ex1 of Ex is
Begin
  Process (N, M, P)
  Variable t ;  integer ;
  Constant y; arry3:=(((5, 4,3),(8, 9, 10),(32, 33, 34)),((42, 43,44),(52, 53,54),(-10, -7, -5)));
begin
    t : = y(M)(N)(P);
    z <= t ; end process ; end  Ex1 ;
```

(i) What is the value of the following element of y?
Y(0, 0, 0), Y(0, 0, 1), Y(0, 0, 2), Y(0, 1, 2), Y(1, 1, 2), Y(1, 2, 2)

(ii) If we change all (N downto 0) and (M downto 0) in package arry to (0 to N) and (0 to M). What will be the values of the elements in part (i). **(08 Marks)**

c. Which line in the above program 6(b) attaches a package to the VHDL program? Explain each word in that line and significance of each word. **(04 Marks)**

7 a. Write mixed-language description of a master slave JK-ff with a clear input invoking a VHDL entity from a verilog module. **(12 Marks)**

b. Discuss the facts of the mixed language description. **(08 Marks)**

8 a. Define synthesis. With a neat flow chart, explain the steps involved in a synthesis. **(08 Marks)**

b. Write a behavioral code in verilog for a 2 to 4 decoder with a active low output. Show the gate level synthesis for the code. **(06 Marks)**

c. Extract the gate level synthesis for the verilog code below:

```
module example (BP, ADH);
input [2 : 0] BP;
output [3 : 0] ADH;
reg [3 : 0] ADH;
always @ (BP)
    begin
        if (BP<=2) ADH = 15 ;
        else if (BP>=5) ADH = 0;
          else ADH = BP*(-5) + 25 ;
        end     end module
```

(06 Marks)

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10EC46

Fourth Semester B.E. Degree Examination, June/July 2017

Linear ICs and Applications

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of standard resistance and capacitance values table is permitted.***

PART – A

1 a. With a neat circuit diagram, explain the working of a basic op-amp circuits. **(07 Marks)**

b. Sketch an op-amp difference amplifier circuit. Explain the operation of the circuit and derive an equation for the output voltage. **(07 Marks)**

c. Two signals each ranging from 0.1V to 1V are to be summed and amplified by a factor of 5. Using 741 op-amp design a suitable inverting summing amplifier circuit. **(06 Marks)**

2 a. Sketch and explain the operation of a capacitor coupled non-inverting amplifier circuit using single polarity power supply with necessary design steps. **(08 Marks)**

b. What is meant by setting upper cutoff frequency in a capacitor coupled op-amp? Explain how it is done in an inverting op-amp. **(06 Marks)**

c. Design a high input impedance capacitor coupled voltage follower using 741 op-amp. The lower cutoff frequency for the circuit is to be 50 Hz and the load resistance of 3.9 KΩ. Also determine the minimum theoretical input impedance of the circuit. (Consider M_{min} = 50000). **(06 Marks)**

3 a. Explain Miller effect compensation. **(08 Marks)**

b. List the precautions to be observed for op-amp stability. **(06 Marks)**

c. Determine the upper cutoff frequency and the maximum distortion free output amplitude for a voltage follower.
i) When a 741 op-amp is used and
ii) When a LF 353 op-amp is used.
For 741: f_2 = 800 kHz, s = 0.5 V/μs.
For LF353 : f_2 = 5 MHz, s = 13 V/μs **(06 Marks)**

4 a. Draw the circuit of an instrumentation amplifier and explain its working and show how voltage gain can be varied. **(08 Marks)**

b. Explain the working of precision full wave rectifier using bipolar op-amp. **(06 Marks)**

c. Sketch the circuit of a current amplifier with floating load. Explain circuit operation and derive an equation for current gain. **(06 Marks)**

PART – B

5 a. With a neat circuit diagram and waveforms, explain the working of triangular/rectangular waveform generator. **(08 Marks)**

b. With a neat circuit diagram, explain multiplier and divider. **(06 Marks)**

c. Using a 741 op-amp with ±12 V supply, design a phase shift oscillator to have an output frequency of 5 kHz. **(06 Marks)**

6 a. With a neat circuit diagram, explain the operation of an inverting Schmitt trigger circuit. **(06 Marks)**

b. Using op-amp, design a second order high pass filter to have a cutoff frequency of 7 kHz. **(06 Marks)**

c. With a neat circuit diagram and waveforms, explain the operation of a stable multivibrator using op-amp. Also include design steps. **(08 Marks)**

7 a. What is an voltage regulator? With a neat sketch, explain the working of series op-amp regulator. **(06 Marks)**

b. Design a voltage regulator using IC 723 to get an output voltage of 5V. **(06 Marks)**

c. Explain the basic principle of operation of switching regulator. Discuss its advantages and limitations. **(08 Marks)**

8 a. Explain monostable multivibrator using IC 555. **(06 Marks)**

b. Explain the operation of phase locked loop (PLL) with the help of neat block diagram. **(07 Marks)**

c. With a neat block diagram, explain successive approximation ADC. **(07 Marks)**

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