CBCS Scheme

USN | | | | | | | | | | |

15MAT31

Third Semester B.E. Degree Examination, June/July 2018
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Obtain the Fourier series for the function :

$$f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$$

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ----$. **(08 Marks)**

b. Obtain the half–range cosine series for the function $f(x) = (x-1)^2$, $0 \le x \le 1$. Hence deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + -----$. **(08 Marks)**

OR

2 a. Find the Fourier series of the periodic function defined by $f(x) = 2x - x^2$, $0 < x < 3$. **(06 Marks)**

b. Show that the half range sine series for the function $f(x) = \ell x - x^2$ in $0 < x < \ell$ is

$$\frac{8\ell^2}{\pi^3} \sum_0^\infty \frac{1}{(2n+1)^3} \sin\left(\frac{2n+1}{\ell}\right)\pi x .$$ **(05 Marks)**

c. Express y as a Fourier series upto 1st harmonic given :

x	0	1	2	3	4	5
y	4	8	15	7	6	2

(05 Marks)

Module-2

3 a. Find the Fourier transform of

$$f(x) = \begin{cases} 1-|x|, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$$

and hence deduce that $\int_0^\infty \frac{\sin^2 t}{t^2} dt = \frac{\pi}{2}$. **(06 Marks)**

b. Find the Fourier Sine and Cosine transforms of $f(x) = e^{-\alpha x}$, $\alpha > 0$. **(05 Marks)**

c. Solve by using z – transforms $y_{n+1} + \frac{1}{4} y_n = \left(\frac{1}{4}\right)^n$ $(n \ge 0), y_0 = 0$. **(05 Marks)**

OR

4 a. Find the Fourier transform of $f(x) = e^{-|x|}$. **(06 Marks)**

b. Find the Z – transform of $\sin(3n + 5)$. **(05 Marks)**

c. Find the inverse Z – transform of : $\frac{z}{(z-1)(z-2)}$. **(05 Marks)**

Module-3

5 a. Find the correlation coefficient and the equation of the line of regression for the following values of x and y. **(06 Marks)**

x	1	2	3	4	5
y	2	5	3	8	7

b. Find the equation of the best fitting straight line for the data : **(05 Marks)**

x	0	1	2	3	4	5
y	9	8	24	28	26	20

c. Use Newton – Raphson method to find a real root of the equation $x \log_{10} x = 1.2$ (carry out 3 iterations). **(05 Marks)**

OR

6 a. Obtain the lines of regression and hence find the coefficient of correlation for the data :

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(06 Marks)

b. Fit a second degree parabola to the following data : **(05 Marks)**

x	1	2	3	4	5
y	10	12	13	16	19

c. Use the Regula–Falsi method to find a real root of the equation $x^3 - 2x - 5 = 0$, correct to 3 decimal places. **(05 Marks)**

Module-4

7 a. Given $\sin 45° = 0.7071$, $\sin 50° = 0.7660$, $\sin 55° = 0.8192$, $\sin 60° = 0.8660$ find $\sin 57°$ using an appropriate interpolation formula. **(06 Marks)**

b. Construct the interpolation polynomial for the data given below using Newton's divided difference formula :

x	2	4	5	6	8	10
y	10	96	196	350	868	1746

(05 Marks)

c. Use Simpson's $\frac{1}{3}$rd rule with 7 ordinates to evaluate $\int_2^8 \frac{dx}{\log_{10} x}$. **(05 Marks)**

OR

8 a. Given f(40) = 184, f(50) = 204, f(60) = 226, f(70) = 250, f(80) = 276, f(90) = 304, find f(38) using Newton's forward interpolation formula. **(06 Marks)**

b. Use Lagrange's interpolation formula to fit a polynomial for the data :

x	0	1	3	4
y	–12	0	6	12

Hence estimate y at x = 2. **(05 Marks)**

c. Evaluate $\int_0^1 \frac{x}{1+x^2}\,dx$ by Weddle's rule taking seven ordinates and hence find $\log_e 2$. **(05 Marks)**

Module-5

9 a. Find the area between the parabolas $y^2 = 4x$ and $x^2 = 4y$ using Green's theorem in a plane. **(06 Marks)**

b. Verify Stoke's theorem for the vector $\vec{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by x = 0, x = a, y = 0, y = b. **(05 Marks)**

c. Find the extremal of the functional : $\int_{x_1}^{x_2} [y' + x^2 (y')^2]\,dx$. **(05 Marks)**

OR

10 a. Verify Green's theorem in a plane for $\oint_c (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$ where c is the boundary of the region enclosed by $y = \sqrt{x}$ and $y = x^2$. **(06 Marks)**

b. If $\vec{F} = 2xyi + yz^2 j + xzk$ and S is the rectangular parallelopiped bounded by x = 0, y = 0, z = 0, x = 2, y = 1, z = 3 evaluate $\iint_S \vec{F} \cdot \hat{n}\,ds$. **(05 Marks)**

c. Find the geodesics on a surface given that the arc length on the surface is $S = \int_{x_1}^{x_2} \sqrt{x[1 + (y')^2}\,dx$. **(05 Marks)**

* * * * *

CBCS Scheme

USN | | | | | | | | | | |

15EE32

Third Semester B.E. Degree Examination, June/July 2018
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. For the circuit shown in Fig.Q.1(a), find i_A, i_B and i_C by mesh analysis. **(05 Marks)**

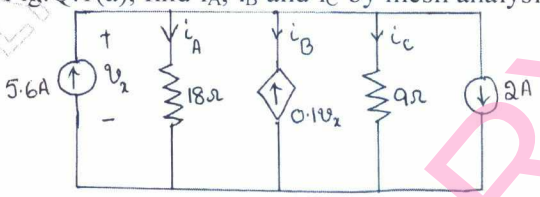

Fig.Q.1(a)

b. Find the equivalent resistance across terminals AB of the network shown in Fig.Q.1(b) using star-delta transformation. Consider all resistance as 10Ω. **(05 Marks)**

Fig.Q.1(b)

c. Compute resonant frequency, half power frequencies, bandwidth and quality factor for a given RLC series circuit with R = 20Ω, L = 50mH and C = 1μF. Also calculate the reactances at resonance. **(06 Marks)**

OR

2 a. Two branches of a parallel circuit have elements R_L = 6Ω, L = 1mH and R_C = 4Ω and C = 20 μF. Determine the frequency of resonance when excited with voltage source of variable frequency. **(05 Marks)**

b. Write the equilibrium equations using KVL for the network shown in Fig.Q.2(b). Draw its dual and also write its equilibrium equations. **(05 Marks)**

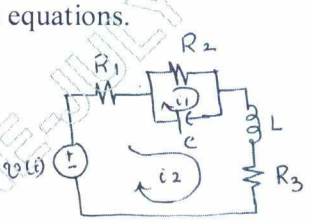

Fig.Q.2(b)

c. In the network shown in Fig.Q.2(c), solve for all the branch currents using nodal analysis and also show that the sum of power absorbed/delivered by all branches is zero. **(06 Marks)**

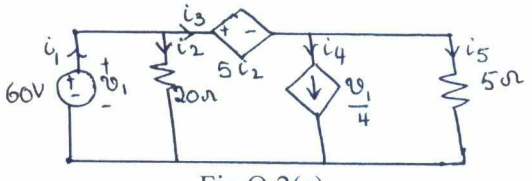

Fig.Q.2(c)

Module-2

3 a. State and prove superposition theorem with an illustration. **(05 Marks)**

b. Obtain the Thevenin equivalent circuit as seen by the load impedance for the network shown in Fig.Q.3(b). **(05 Marks)**

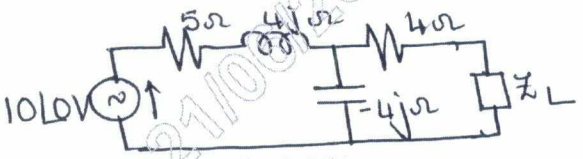

Fig.Q.3(b)

c. State Millman's theorem and apply it to find the current through R_L in the circuit shown in Fig.Q.3(c). **(06 Marks)**

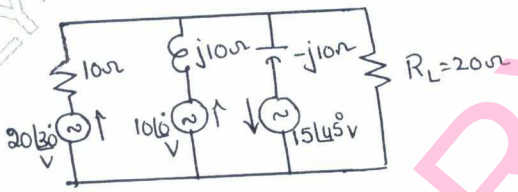

Fig.Q.3(c)

OR

4 a. Prove that maximum power is transferred to the load in an ac circuit when $Z_L = Z_i^*$ where, Z_L = load impedance = $R_L + jx_L$, Z_i = impedance seen at the source $R_i + jx_i$. **(05 Marks)**

b. Determine the Norton equivalent circuit shown in Fig.Q.4(b) as seen by the terminals 'a' and 'b'. **(05 Marks)**

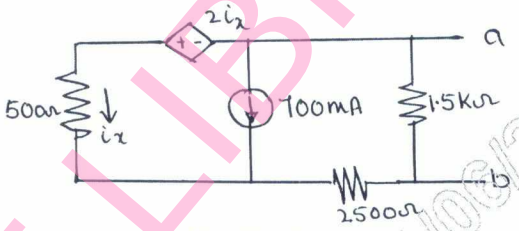

Fig.Q.4(b)

c. In the single source network shown in Fig.Q.4(c), find the current 'I' flowing through the 5Ω branch. Also verify reciprocity theorem for this circuit **(06 Marks)**

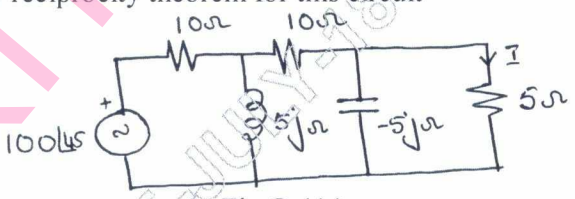

Fig.Q.4(c)

Module-3

5 a. In the network shown in Fig.Q.5(a), switch is changed from position 'a' to 'b' at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0+$ if R = 1000Ω, L = 1H, C = 0.1μF and V = 100V. **(05 Marks)**

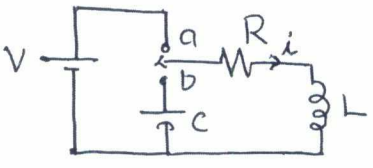

Fig.Q.5(a)

b. In the circuit shown in Fig.Q.5(b), switch is opened at time t = 0. Find the values of V, $\frac{dv}{dt}$, $\frac{d^2v}{dt^2}$ at t = 0+ and v(∞). **(05 Marks)**

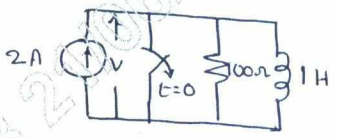

Fig.Q.5(b)

c. Consider a circuit consisting of 1Ω resistance in series with 1F capacitor excited with 5V DC source. Derive an expression for the current flowing in the circuit and draw the current waveform and also calculate the current at 0.1 sec. **(06 Marks)**

OR

6 a. Discuss the behaviour of R, L, C elements at,
i) the time of switching (t = 0+) ii) under steady state (t = ∞). **(06 Marks)**

b. In the circuit shown in Fig.Q.6(b), the switch was in position 'a' and circuit was under steady state. At t = 0, the switch is moved to position b. Find $v_c(t)$ at t equal to i) 0- ii) 0+ iii) ∞ iv) 0.08S. **(10 Marks)**

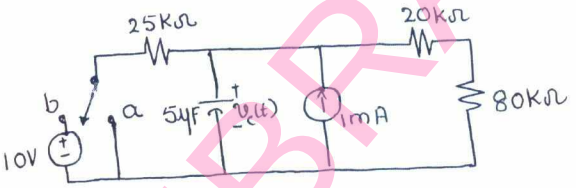

Fig.Q.6(b)

Module-4

7 a. Synthesize the waveform shown in Fig.Q.7(a) and also write the Laplace transform of the synthesized equation. **(05 Marks)**

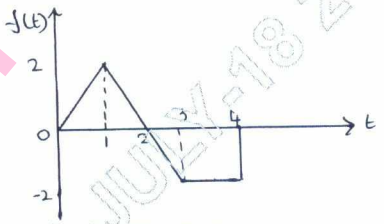

Fig.Q.7(a)

b. State and prove final value theorem as applied in Laplace transform and hence find x(∞) of $x(s) = \frac{5}{s(s+1)(s+2)}$. **(05 Marks)**

c. Determine the voltage $v_c(t)$ for t ≥ 0 for the circuit shown in Fig.Q.7(c) using Laplace transform method. In the circuit, switch is opened at t = 0. **(06 Marks)**

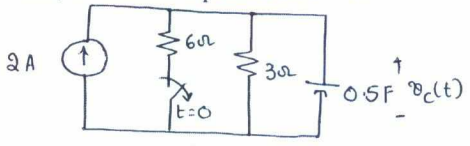

Fig.Q.7(c)

OR

8 a. In the circuit shown in Fig.Q.8(a), the switch is initially in closed position. The switch is opened at t = 0. Determine the expression for current through the resistor using Laplace transform method for $t \geq 0$. **(05 Marks)**

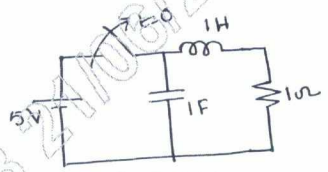

Fig.Q.8(a)

b. Find the Laplace transform of the periodic signal shown in Fig.Q.8(b). **(05 Marks)**

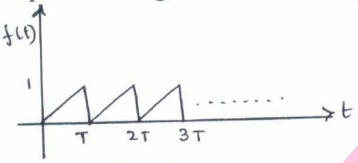

Fig.Q.8(b)

c. Derive an expression for the current flowing through a series RL circuit excited with a DC source of V volts using Laplace transform method. **(06 Marks)**

Module-5

9 a. Derive an expression for 'Displacement voltage of neutral' in a star connected unbalanced load supplied with 3ϕ balanced supply voltages. **(05 Marks)**

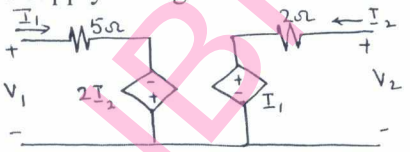

Fig.Q.9(b)

b. Find the Y parameters for the network shown in Fig.Q.9(b). **(05 Marks)**

c. Obtain the driving point impedance function for the network shown in Fig.Q.9(c). Also plot the poles and zeros in the s plane. **(06 Marks)**

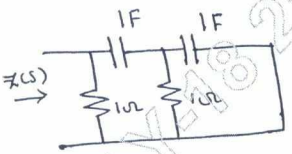

Fig.Q.9(c)

OR

10 a. An unbalanced 3ϕ load is supplied by a symmetrical, 3ϕ, 440V, 3 wire system. The star connected load branch impedances are $Z_R = 5\angle 30^\circ\,\Omega$, $Z_Y = 10\angle 45^\circ\,\Omega$ and $Z_B = 10\angle 60^\circ\,\Omega$. Find the line currents. **(09 Marks)**

b. Obtain T parameters for the network shown in Fig.Q.10(b). Using these parameters, find Z parameters. **(07 Marks)**

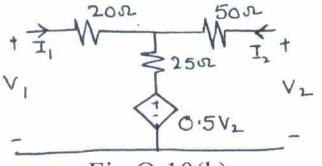

Fig.Q.10(b)

* * * * *

CBCS Scheme

USN | | | | | | | | | | |

15EE33

Third Semester B.E. Degree Examination, June/July 2018
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume Missing data if any.

Module-1

1 a. Draw and explain the full load phasor diagrams of single phase transformer for lagging and leading process factor loads. **(06 Marks)**

b. Find the All day efficiency of single phase transformer having maximum efficiency of 98% at 15 KVA at UPF and loaded as follows :
12 hours – 2KW at 0.5 power factor lagging
6 hours – 2KW at 0.8 power factor lagging
6 hours – no load. **(06 Marks)**

c. Draw the approximate Equivalent circuit of a transformer referred to primary side. **(04 Marks)**

OR

2 a. State the advantages of single three phase transformers over bank of single phase transformer. **(05 Marks)**

b. Explain with the help of connection and phasor diagrams, how scott connections are used to obtain two base supply from three phase supply mains. **(06 Marks)**

c. The following results were obtained on a
50 KVA, 2400/120V, transformer
O.C test : 396W, 9.65A, 120V
S.C test : 810W, 20.8A, 92V
Determine : i) The circuit constants
ii) The efficiency at full load, 0.8 p.f. lagging
iii) The approximate vtg regulation. **(05 Marks)**

Module-2

3 a. Discuss the necessary conditions for the parallel operation of 2 transformers. **(05 Marks)**

b. Drive an expression for the currents shared by between 2 transformers connected in parallel supplying a common load when no load voltages of these transformers are un equal. **(06 Marks)**

c. How stabilization is achieved due to tertiary winding. **(05 Marks)**

OR

4 a. With the help of neat sketches, explain the working of ON load tap changer and OFF load tap changer. **(10 Marks)**

b. Define auto transformer? Derive an expression for the saving of copper in an Auto transformer. **(06 Marks)**

Module-3

5 a. Discuss the causes of noise in transformers? How to reduce the noise in transformers. **(05 Marks)**

b. Explain current Inrush phenomenon in transformers. **(05 Marks)**

c. With a circuit diagram, explain in detail Sumpner's test for determining the efficiency and voltage regulation of transformer. **(06 Marks)**

OR

6 a. With a neat circuit diagram, explain armature reaction in DC machines. **(06 Marks)**
b. Draw and explain the characteristics of DC shunt generator. **(05 Marks)**
c. Derive EMF Equation of synchronous generator. **(05 Marks)**

Module-4

7 a. With phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. **(08 Marks)**
b. Define voltage regulation of an alternators. **(03 Marks)**
c. What is synchronization of alternators? Need for parallel operation of alternators. **(05 Marks**

OR

8 a. With a neat circuit diagram explain the slip test on salient pole synchronous machine to determine X_d and X_q from slip test. **(08 Marks)**
b. Write a note on V-curves of synchronous generator. **(04 Marks)**
c. Define electrical load diagram of a synchronous generator. **(04 Marks)**

Module-5

9 a. What are the various methods of determining the voltage regulation for 3ϕ alternator and explain any one method in detail. **(08 Marks)**
b. The open and short circuit test reading for a 3ϕ - star connected 1000 KVA, 200V, 50Hz synchronous generator are,

Field amps	10	20	25	30	40	50
OC terminal vtg	800	1500	1760	2000	2350	2600
SC armature current in amp	–	200	250	300	–	–

The armature effective resistance is 0.2ohm per phase. Draw the characteristic curves and estimate the full load percentage regulation i) 0.8 p.f lagging ii) 0.8 p.f leading. **(08 Marks)**

OR

10 a. Write a short note on capability curves of synchronous generator. **(06 Marks)**
b. Discuss about hunting in synchronous machines. Also explain the role of damper winding. **(06 Marks)**
c. Discuss about short circuit ratio and its significance. **(04 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE34

Third Semester B.E. Degree Examination, June/July 2018
Analog Electronic Circuits

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 E_{Th}, I_B and V_{CE} for voltage divider bias circuit using exact analysis. **(08 Marks)**

b. For the emitter bias network of Fig.Q1(b), determine the following parameters:
(i) I_B (ii) I_C (iii) V_{CE} (iv) V_C (v) V_E (vi) V_B (vii) V_{BC} **(08 Marks)**

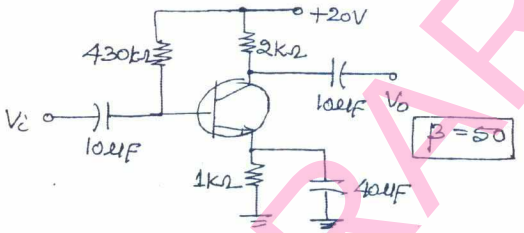

Fig.Q1(b)

OR

2 a. Derive the expression for stability factor for fixed bias circuit with respect to I_{CO}, V_{BE} and β. **(10 Marks)**

b. With a neat circuit diagram explain the operation of self bias circuit. **(06 Marks)**

Module-2

3 a. With the help of r_e equivalent model, derive an equation for input impedance, output impedance and voltage gain for an emitter follower configuration. **(08 Marks)**

b. For the collector feedback configuration having R_F = 180 kΩ, R_C = 2.7 kΩ, C_1 = 10 μF, C_2 = 10 μF, β = 200, $r_0 = \infty$ Ω and V_{CC} = 9 volts, determine the following parameters:
(i) r_e (ii) Z_i (iii) Z_o (iv) A_V **(08 Marks)**

OR

4 a. High frequency response BJT Amplifier has the following parameters:
R_S = 1 kΩ, R_1 = 40 kΩ, R_2 = 10 kΩ, R_E = 2 kΩ, R_C = 4 kΩ, R_L = 2.2 kΩ, C_S = 10 μF, C_C = 1 μF, C_E = 20 μF, β = 100, r_e = 15.76 Ω, R_i = 1.32 kΩ, A_{Vmid}(Amplifier) = –90 , $r_o = \infty$ Ω, V_{CC} = 20 V, C_{be} = 36 pF, C_{bc} = 4 pF, C_{ce} = 1 pF, C_{wi} = 6 pF, C_{wo} = 8 pF
(i) Determine f_{Hi} and f_{Ho} (ii) Determine f_β and f_T **(08 Marks)**

b. Derive equations for Miller input capacitance and Miller output capacitance **(08 Marks)**

Module-3

5 a. Derive expressions for Z_i and A_i for a Darlington emitter follower circuit. **(10 Marks)**

b. Explain the need of a cascading amplifier? Draw and explain the block diagram of two stage cascade amplifier. **(06 Marks)**

OR

6 a. List the general characteristics of negative feedback amplifiers. **(04 Marks)**

b. Determine the voltage gain, input impedance and output impedance with feedback for voltage series feedback amplifier having $A = -100$, $R_i = 10\ k\Omega$, $R_o = 20\ k\Omega$ for feedback of (i) $\beta = -0.1$ and (ii) $\beta = -0.5$. **(06 Marks)**

c. For a current series feedback amplifier, derive an expression for output impedance with feedback. **(06 Marks)**

Module-4

7 a. With a neat circuit and waveforms, explain the operation of a transformer coupled class-A power amplifier. **(08 Marks)**

b. Show that maximum efficiency of class-B push pull power amplifier circuit is 78.54%. **(08 Marks)**

OR

8 a. With a neat circuit diagram and waveform explain the operation of RC phase shift oscillator using BJT. Write the expression for frequency of oscillation. **(08 Marks)**

b. With a neat circuit diagram and waveform, explain the working principle of crystal oscillator operating in series resonant mode. A crystal has the following parameters: L = 0.334 H, C = 0.065 PF and R = 5.5 kΩ. Calculate the resonant frequency. **(08 Marks)**

Module-5

9 a. Derive the expression for A_v, Z_i and Z_o for a JFET common source amplifier with fixed bias configuration. **(08 Marks)**

b. For a self bias JFET circuit, $V_{DD} = +12V$, $R_D = 2.2\ k\Omega$, $R_G = 1\ m\Omega$, $R_S = 1\ k\Omega$, $I_{DSS} = 8mA$, $V_P = -4$ volts. Determine the following parameters:
(i) V_{GS} (ii) I_D (iii) V_{DS} (iv) V_S (v) V_G (vi) V_D **(08 Marks)**

OR

10 a. Derive expression for V_{GS}, I_D, V_{DS}, V_D and V_S for a voltage divider bias circuit using FET. **(08 Marks)**

b. With neat sketches, explain the basic operation and characteristics of n-channel depletion type MOSFET. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE35

Third Semester B.E. Degree Examination, June/July 2018
Digital System Design

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define combinational logic, canonical SOP and canonical POS, with examples. **(06 Marks)**

b. Place the following equations into proper canonical form:

i) $R = f(a,b,c) = (\bar{a}+b)(b+\bar{c})$ into minterm canonical form.

ii) $Z = f(a,b,c) = a + \overline{ab}$ into maxterm canonical form. **(04 Marks)**

c. Solve the following Boolean equation using four variable Karnaugh map and implement the simplified equation using minimum number of logic gates.
$f(a, b, c, d) = \sum (0, 5, 7, 8, 10, 13) + d (2, 4, 14, 15)$. **(06 Marks)**

OR

2 a. Solve four variable expression using Quine McCluskey minimization technique.
$K = f(a,b,c,d) = \pi M(0,3,4,7,8,10,12,14) + d(2,6)$ **(08 Marks)**

b. Simplify the Boolean expression using a 3-variable VEM, with 'Z' as MEV
$f(w, x, y, z) = \sum m (3, 4, 5, 7, 8, 11, 12, 13, 15)$. **(08 Marks)**

Module-2

3 a. Implement 3-bit binary to gray code conversion circuit using IC 74139. Draw neat diagram, truth table with switching equations in SOP form. **(06 Marks)**

b. Implement the following multiple output functions for active low outputs using IC74138.
$F_1 = f(x,y,z) = \bar{x}y + xy\bar{z} + xz$, $F_2 = f(x,y,z) = \pi(0,1,4,5,7)$. **(04 Marks)**

c. What are multiplexers? Implement the function using 8:1 MUX,
$f(a, b, c, d) = \sum m(0, 1, 3, 4, 7, 10, 11, 14, 15)$. **(06 Marks)**

OR

4 a. Implement 4-bit parallel adder/subtractor using 4-full adder blocks. If $C_{in} = 0$ the circuit should act as adder and if $C_{in} = 1$ the circuit should act as substractor. Explain its operation by considering examples. **(06 Marks)**

b. What is the problem associated with the parallel adder? Explain the method of correcting it, with suitable circuit and equations. **(06 Marks)**

c. Design 1-bit comparator circuit, represent truth table, K-maps and logic diagram. **(04 Marks)**

Module-3

5 a. Explain the operation of Master-Slave JK flip-flop with logic diagram, truth table, symbol and timing diagram. **(08 Marks)**

b. Distinguish between sequential circuits and combinational circuits. **(04 Marks)**

c. Explain the operation of basic bistable element, using two-inverter configuration. **(04 Marks)**

OR

6 a. Derive characteristics equations for SR flip-flop and JK flip-flop, represent truth table and K-maps. **(04 Marks)**

b. Explain the operation of 4-bit ring counter and twisted ring counter. **(06 Marks)**

c. Design synchronous MOD6 counter using clocked 'D' flip flops for the sequence $0 \rightarrow 2 \rightarrow 3 \rightarrow 6 \rightarrow 5 \rightarrow 1$, again, 0.... represent application table, excitation table and logic diagram. **(06 Marks)**

Module-4

7 a. Define state variables and excitation variables and write a note on Moore and Mealy sequential models. **(08 Marks)**

b. For the logic diagram shown in Fig.Q.7(b), find excitation table, state table and state diagram. **(08 Marks)**

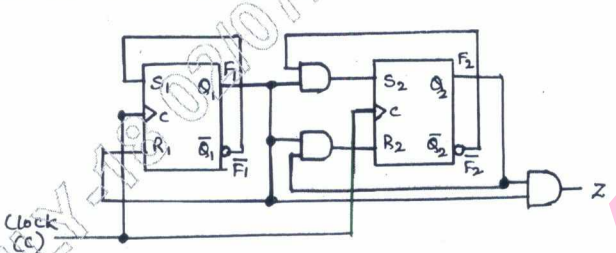

Fig.Q.7(b)

OR

8 a. Analyze the circuit shown in Fig.Q.8(a), obtain excitation table, state table and state diagram. **(10 Marks)**

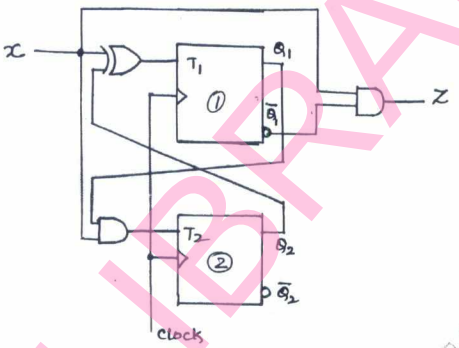

Fig.Q.8(a)

b. Design the sequential logic circuit for single input single output system shown in Fig.Q.8(b) state diagram using clocked 'D' flip-flop. **(06 Marks)**

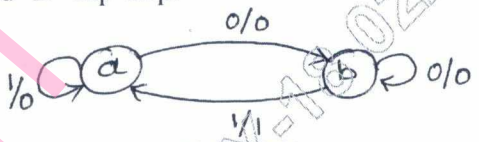

Fig.Q.8(b)

Module-5

9 a. Explain the structure of VHDL and verilog module with example code for each and compare them. **(08 Marks)**

b. List the various styles/types of descriptions in VHDL and verilog. Explain VHDL structural description with example code. **(08 Marks)**

OR

10 a. Explain the structure of data flow description in VHDL and verilog, using suitable example code. **(08 Marks)**

b. Write VHDL and verilog code for 2 × 2 magnitude comparator for all input combinations. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE36

Third Semester B.E. Degree Examination, June/July 2018
Electrical and Electronic Measurements

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Discuss limitations of Wheatstone Bridge and explain how low resistance is measured by KDB. **(08 Marks)**

b. For an ac bridge evaluate unknown impedance in the arm DC when bridge is balanced at 2khz with following components in each arm.
Arm AB: 10kΩ
Arm BC: 100μF series with 100kΩ
Arm AD: 50kΩ
Detector is connected between B and D. **(08 Marks)**

OR

2 a. Obtain the dimensional equations in SI units for
i) Absolute permeability ii) Absolute permittivity. **(06 Marks)**

b. Discuss how capacitance of the capacitor is measured by Schering bridge. **(10 Marks)**

Module-2

3 a. Reproduce the errors in 1-ϕ kWh meter and explain how energy meter calibrated. **(08 Marks)**

b. A 1-ϕ energy meter operating at normal 1-ϕ voltage has a constant load of 4A passing through it for 6 hrs at 0.8 power factor. If the meter disc makes 2209 revolutions during this period, what is the meter constant in revolutions/kWh? Calculate the power factor of the load if the number of revolutions made by meter are 1472 when operated at normal 1-ϕ AC supply at 5A for 4 hrs. **(08 Marks)**

OR

4 a. Explain the construction and operating principle of Weston frequency meter and 1-ϕ pf meter. **(08 Marks)**

b. Discuss phase sequence indicator. **(03 Marks)**

c. A Wattmeter has current coil and pressure coil resistance of 0.2Ω and 5000Ω respectively. Evaluate the percentage of error in the Wattmeter reading when load takes 20A, at 250V with 0.8 pf lag for two methods of connection of Wattmeter. **(05 Marks)**

Module-3

5 a. Discuss Silsbee's method of testing CT. **(08 Marks)**

b. What do you mean by shunts and multipliers and derive the expression for shunt and multipliers. **(08 Marks)**

OR

6 a. Discuss how the iron losses are measured by using Wattmeter. **(07 Marks)**

b. List advantages of instrument transformers. **(02 Marks)**

c. Discuss how leakage flux is measured. **(07 Marks)**

Module-4

7 a. List advantages of electronic meters over the conventional meters. **(03 Marks)**

b. Discuss construction and operation of TRUE RMS reading voltmeter. **(05 Marks)**

c. List characteristics of DVM and explain successive approximation type DVM. **(08 Marks)**

OR

8 a. Explain the principle of operation Q meter and discuss different application of Q-meter. **(08 Marks)**

b. List different types of DVM. Explain with sketch the Ramp type DVM. **(08 Marks)**

Module-5

9 a. Explain why recorders are essential? With sketch explain x-y recorder. **(08 Marks)**

b. Discuss with necessary figure i) ECG ii) EEG. **(08 Marks)**

OR

10 a. Write a short notes on i) LED ii) Nixie tube iii) LCD. **(08 Marks)**

b. With neat sketch explain LVDT recorder. **(05 Marks)**

c. Write a short note on dot matrix display. **(03 Marks)**

* * * * *

CBCS Scheme

USN | | | | | | | | | | |

15MATDIP31

Third Semester B.E. Degree Examination, June/July 2018
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the modulus and amplitude of $\frac{(1+i)^2}{3+i}$. **(05 Marks)**

b. Prove that $\left(\frac{1+\cos\theta+i\sin\theta}{1+\cos\theta-i\sin\theta}\right)^n = \cos n\theta + i\sin n\theta$. **(05 Marks)**

c. If $z = \cos\theta + i\sin\theta$, then show that $x^n + \frac{1}{x^n} = 2\cos n\theta$, $x^n - \frac{1}{x^n} = 2i\sin n\theta$. **(06 Marks)**

OR

2 a. Find the sine of the angle between $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$. **(05 Marks)**

b. Find the unit vector perpendicular to both $\vec{a}$ and $\vec{b}$, where $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + \hat{j} + \hat{k}$ **(05 Marks)**

c. Show that (3, –2, 4), (6, 3, 1), (5, 7, 3) and (2, 2, 6) are coplanar. **(06 Marks)**

Module-2

3 a. Find the n^{th} derivative of sin(3x)cosx. **(05 Marks)**

b. Find the angle between radius vector and tangent to the curve $\gamma^m \cos m\theta = a^m$. **(05 Marks)**

c. Find the pedal equation of $\gamma = a(1 + \cos\theta)$. **(06 Marks)**

OR

4 a. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin(2u)$. **(05 Marks)**

b. If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$. **(05 Marks)**

c. If $u = x + y$, $v = y + z$, $w = z + x$, find $J\left(\frac{uvw}{xyz}\right)$. **(06 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi} x \cos^6 x \, dx$. **(05 Marks)**

b. Evaluate $\int_0^{\infty} \frac{x^2}{(1+x^6)^{7/2}} dx$ **(05 Marks)**

c. Evaluate $\int_0^1 x^5 (1-x^2)^{5/2} dx$. **(06 Marks)**

OR

6 a. Evaluate $\int_1^2 \int_3^4 (xy + e^y) \, dy \, dx$. **(05 Marks)**

b. Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy \, dy \, dx$. **(05 Marks)**

c. Evaluate $\int_0^1 \int_0^1 \int_0^y xyz \, dx \, dy \, dz$. **(06 Marks)**

Module-4

7 a. Find the angle between the tangents to the curve $x = t^2, y = t^3, z = t^4$ at $t = 2$, and $t = 3$. **(05 Marks)**

b. Find the unit normal to the curve $\vec{\gamma} = 4\sin t \, \hat{i} + 4\cos t \, \hat{j} + 3t \, \hat{k}$. **(05 Marks)**

c. Find the velocity and acceleration to the curve $\vec{\gamma} = t^2 \hat{i} - t^3 \hat{j} + t^4 \hat{k}$ at $t = 1$. **(06 Marks)**

OR

8 a. Find the directional derivative of $\varphi = x^3 y^3 z^3$ at (1, 2, 1) in the direction of $\hat{i} + 2\hat{j} + 2\hat{k}$. **(05 Marks)**

b. Find the unit normal to the surface $xy + x + zx = 3$ at $(1, 1, 1)$. **(05 Marks)**

c. If $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$, find div $\vec{F}$. **(06 Marks)**

Module-5

9 a. Solve $\frac{dy}{dx} = \frac{y^2}{xy - x^2}$. **(05 Marks)**

b. Solve $\frac{dy}{dx} + y\cot x = \sin x$. **(05 Marks)**

c. Solve $y(x + y)dx + (x + 2y - 1)dy = 0$. **(06 Marks)**

OR

10 a. Solve $(x^2 + y)dx + (y^3 + x)dy = 0$. **(05 Marks)**

b. Solve $\frac{dy}{dx} + \frac{y}{x} = xy^2$. **(05 Marks)**

c. Solve $(x^2 + y^2)\frac{dy}{dx} = xy$. **(06 Marks)**

* * * * *