III EC, EE (S)

CBCS Scheme

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15MAT31

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Expand $f(x) = x - x^2$ as a Fourier series in the interval $(-\pi, \pi)$. **(08 Marks)**

b. Obtain the half-range cosine series for the function $f(x) = x(l - x)$ in the interval $0 \le x \le l$. **(08 Marks)**

OR

2 a. Obtain the Fourier series of $f(x) = \frac{\pi - x}{2}$ in $0 < x < 2\pi$. Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots$ **(06 Marks)**

b. Find the half-range sine series for the function

$$f(x) = \begin{cases} \frac{1}{4} - x & \text{in } 0 < x < 1/2 \\ x - \frac{3}{4} & \text{in } 1/2 < x < 1 \end{cases}.$$ **(05 Marks)**

c. Compute the constant term and the coefficient of the 1st sine and cosine terms in the Fourier series of y as given in the following table:

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

(05 Marks)

Module-2

3 a. If $f(x) = \begin{cases} 1 - x^2; & |x| < 1 \\ 0; & |x| \ge 1 \end{cases}$. Find the Fourier transform of f(x) and hence find the value of $\int_0^\infty \frac{x\cos x - \sin x}{x^3} dx$. **(06 Marks)**

b. Find the Fourier sine and cosine transform of

$$f(x) = \begin{cases} x, & 0 < x < 2 \\ 0, & \text{elsewhere} \end{cases}.$$ **(05 Marks)**

c. Solve using Z-transform $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$, $y_1 = 2$. **(05 Marks)**

OR

4 a. Obtain the inverse Fourier sine transform of $F_S(\alpha) = \frac{e^{-a\alpha}}{\alpha}$, $a > 0$. **(06 Marks)**

b. Find the Z-transform of $2n + \sin\left(\frac{n\pi}{4}\right) + 1$. **(05 Marks)**

c. If $U(z) = \frac{z}{z^2 + 7z + 10}$, find the inverse Z-transform. **(05 Marks)**

Module-3

5 a. Obtain the coefficient of correlation for the following data:

x :	10	14	18	22	26	30
y :	18	12	24	6	30	36

(06 Marks)

b. By the method of least square find the straight line that best fits the following data:

x :	1	2	3	4	5
y :	14	27	40	55	68

(05 Marks)

c. Use Newton-Raphson method to find a root of the equation $\tan x - x = 0$ near $x = 4.5$. Carry out two iterations. **(05 Marks)**

OR

6 a. Find the regression line of y on x for the following data:

x :	1	3	4	6	8	9	11	14
y :	1	2	4	4	5	7	8	9

Estimate the value of y when $x = 10$. **(06 Marks)**

b. Fit a second degree parabola to the following data:

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(05 Marks)

c. Solve $xe^x - 2 = 0$ using Regula – Falsi method. **(05 Marks)**

Module-4

7 a. From the data given in the following table. Find the number of students who obtained less than 70 marks.

Marks :	0-19	20-39	40-59	60-79	80-99
Number of students :	41	62	65	50	17

(06 Marks)

b. Find the equation of the polynomial which passes through the points (4, -43), (7, 83), (9, 327) and (12, 1053). Using Newton's divided difference interpolation. **(05 Marks)**

c. Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x)dx$ using Simpson's $\frac{3}{8}^{th}$ rule taking six parts. **(05 Marks)**

OR

8 a. Using Newton's backward interpolation formula find the interpolating polynomial for the function given by the following table:

x :	10	11	12	13
f(x) :	22	24	28	34

Hence fine f(12.5). **(06 Marks)**

b. The following table gives the premium payable at ages in years completed. Interpolate the premium payable at age 35 completed. Using Lagrange's formula.

Age completed :	25	30	40	60
Premium in Rs. :	50	55	70	95

(05 Marks)

c. Evaluate $\int_{4}^{5.2} \log_e x \, dx$ taking 6 equal strips by applying Waddles rule. **(05 Marks)**

Module-5

9 a. Verify Green's theorem for $\oint (xy + y^2)dx + x^2 dy$ where c is the closed curve of the region bounded by y = x and y = xz. **(06 Marks)**

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

c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is a catenary. **(05 Marks)**

OR

10 a. Use divergence theorem to evaluate $\iint_S \vec{F}\,\hat{n}\,ds$ over the entire surface of the region above XoY plane bounded by the cone $z^2 = x^2 + y^2$, the plane z = 4 where $\vec{F} = 4xz^1\hat{i} + xyz^2\hat{j} + 3z\hat{k}$. **(06 Marks)**

b. Find the extremal of the functional $\int_{x_1}^{x_2} [(y^1)^2 - y^2 + 2y \sec x]dx$. **(05 Marks)**

c. Prove that the shortest distance between two points in a plane is along the straight line joining them. **(05 Marks)**

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15EE32

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

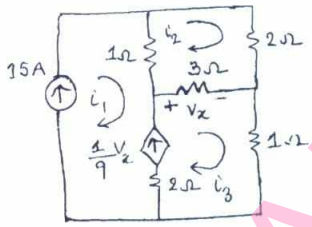
Time: 3 hrs. Max. Marks: 80

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

Module-1

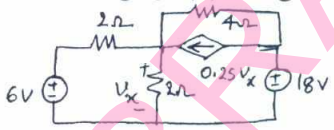
1 a. Find the three unknown currents in the circuit shown in Fig.Q.1(a) using mesh analysis. **(08 Marks)**

Fig.Q.1(a)



b. Find V_x in the circuit diagram shown in Fig.Q.1(b) using source transformation. **(08 Marks)**

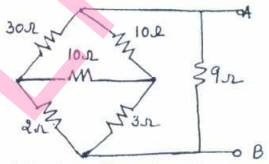
Fig.Q.1(b)



OR

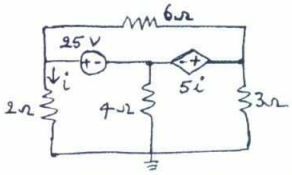
2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a). **(05 Marks)**

Fig.Q.2(a)



b. Find the node voltage V_1, V_2 and V_3 in circuit diagram shown in Fig.Q.2(b) using nodal analysis. **(06 Marks)**

Fig.Q.2(b)

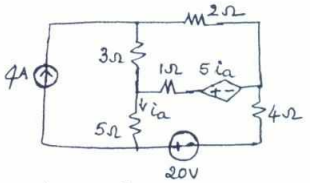


c. A series connected RLC circuit has R = 4Ω, L = 25mH. Calculate the value of C such that Q = 50. Also find resonant frequency, half power frequencies. **(05 Marks)**

Module-2

3 a. Find the current i_a in the circuit show in Fig.Q.3(a) by applying superposition theorem. **(06 Marks)**

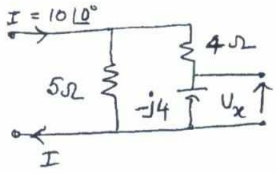
Fig.Q.3(a)



b. Obtain the condition for an alternating voltage source to transfer maximum power to the load when the load impedance is the complex conjugate of the source impedance. **(04 Marks)**

c. Find the voltage 'V_x' and apply reciprocity theorem to the network shown in Fig.Q.3(c). **(06 Marks)**

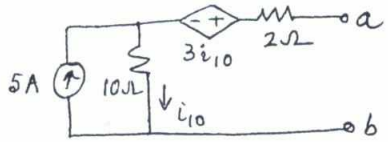
Fig.Q.3(c)



OR

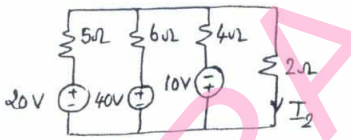
4 a. For the network shown in Fig.Q.4(a), obtain the Norton's equivalent as seen from the terminals a – b. **(08 Marks)**

Fig.Q.4(a)



b. Determine the current I_2 by applying Millman's theorem for the network shown in Fig.Q.4(b). **(08 Marks)**

Fig.Q.4(b)

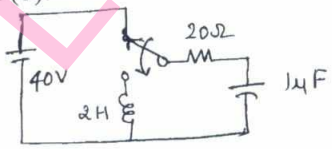


Module-3

5 a. Show the behaviour of R, L, C elements at the time of switching at t = 0 both at $t = 0^+$ and $t = \infty$. **(08 Marks)**

b. Determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ when the switch K is moved from position 1 to 2 at t = 0 for the network shown in Fig.Q.5(b). **(08 Marks)**

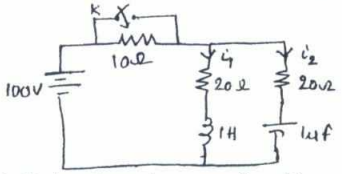
Fig.Q.5(b)



OR

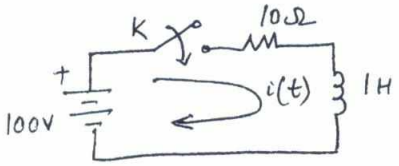
6 a. In the network shown in Fig.Q.6(a) a steady state is reached with switch 'K' open. At time t = 0, the switch is closed. Find at $t = 0^+$, $i_1(t)$, $i_2(t)$ and $\frac{di_1(t)}{dt}$. **(08 Marks)**

Fig.Q.6(a)



b. In the network shown Fig.Q.6(b) K is closed at t = 0 with zero current in the inductor. Find: i(t), $\frac{di(t)}{dt}$ at $t = 0^+$ and obtain an expression for i(t) at $t \geq 0^+$ by classical method. **(08 Marks)**

Fig.Q.6(b)

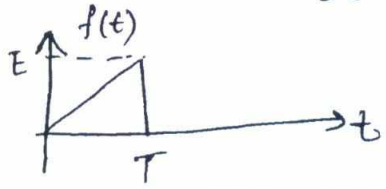


Module-4

7 a. State and prove shifting theorem. **(06 Marks)**

b. Find the Laplace transform of the waveform shown in Fig.Q.7(b). **(06 Marks)**

Fig.Q.7(b)



c. Apply the initial and final value theorem respectively to the s-domain equations of $I_1(s)$ and $I_2(s)$ given,

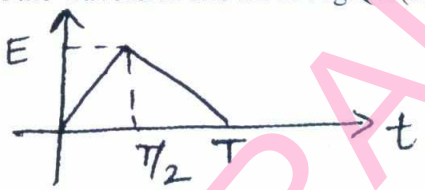
i) $I_1(s) = \frac{6.67(s+250)}{s(s+166.7)}$ ii) $I_2(s) = \frac{6.67}{s+166.7}$ **(04 Marks)**

OR

8 a. Find the Laplace transform of the shifted function given i) 10 u(t – 2) ii) 10 δ(t – 2) iii) 10 r(t – 2) u(t – 2) iv) 10 sin (t – 2) u(t – 2). Also sketch these functions. **(08 Marks)**

b. Find the Laplace transform of the waveform shown in Fig.Q.8(b). **(08 Marks)**

Fig.Q.8(b)



Module-5

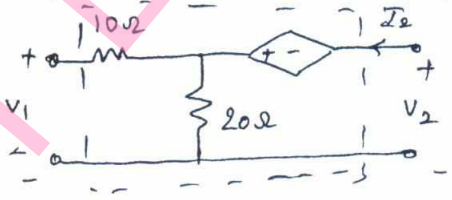
9 a. An unbalanced 3-phase, 4-wire star connected load, has balanced voltages of 208V with ABC phase sequence. Calculate the line currents and the neutral current.

$Z_A = 10\Omega$, $Z_B = 15 \angle 30^\circ\ \Omega$, $Z_C = 10 \angle -30^\circ\ \Omega$. **(06 Marks)**

b. Define Z and Y parameters. **(04 Marks)**

c. Find the T parameters for the 2-port network shown in the Fig.9(c). **(06 Marks)**

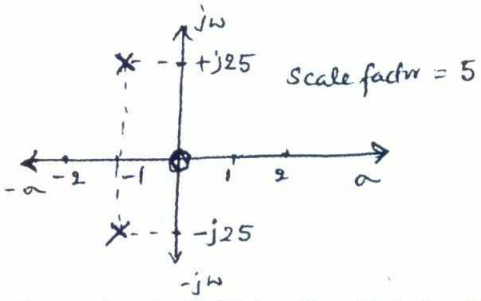
Fig.Q.9(c)



OR

10 a. A series RLC circuit has for its driving point admittance pole-zero diagram as shown in Fig.Q.10(a). Find the valves of R – L – C. **(08 Marks)**

Fig.Q.10(a)



b. Find the response i(t) when input signal i) 5δ (t – 2) ii) 5u(t – 2) is given to a R – L series circuit. Assume initial current through the inductor to be zero. **(08 Marks)**

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15EE33

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Transformers and Generators

Time: 3 hrs. Max. Marks: 80

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

Module-1

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

b. Develop the equivalent circuit of a single phase transformer and show that the parameters of the primary and secondary winding may be combined to give a simplified equivalent circuit referred to primary side. **(05 Marks)**

c. Find the all day efficiency of single phase transformer having maximum efficiency of 98% at 15KVA at uPF and loaded as follows.
12 hours – 2kW at 0.5 pf lagging
6 hours – 2kW at 0.8 pf lagging
6 hours – No Load. **(05 Marks)**

OR

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

b. Explain with circuit diagram and phasor diagram, how two transformers connected in open delta can supply the power successfully. **(05 Marks)**

c. Two electric furnaces are supplied with 1 phase current at 80V from a 3ϕ, 1100V system by means of two single phase scott connected transformers with similar secondary windings, when the load on one furnace is 500kW and on the other 800kW, what current will flow in each of the 3 lines
i) At UPF and ii) 0.8pf lagging. **(06 Marks)**

Module-2

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

b. Derive 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 unequal. **(06 Marks)**

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

OR

4 a. What is an Auto transformer? Derive an expression for the saving of copper in an Auto transformer as compared to an equivalent two winding transformers. What are advantages and limitations? **(08 Marks)**

b. Explain the operation of on load tap changer. **(08 Marks)**

Module-3

5 a. Discuss the harmonics in transformers. **(05 Marks)**

b. What are the sources of Noise in transformers? How to reduce the noise problem in transformers? **(05 Marks)**

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

OR

6 a. What is an armature reaction? With neat figures, explain armature reaction in DC machines under normal working conditions. **(05 Marks)**

b. What is commutation? With a neat diagram, explain the process of commutation in DC machines and explain any one method of improving commutation. **(06 Marks)**

c. Derive EMF equation of synchronous generator. **(05 Marks)**

Module-4

7 a. What is synchronization of alternators? What are the conditions for proper synchronization of alternators? How 3ϕ alternators are synchronized? **(08 Marks)**

b. Define voltage Regulation of an alternator and explain the load characteristics of alternator. **(05 Marks)**

c. Write a note on V-curves of synchronous Generator. **(03 Marks)**

OR

8 a. With a neat circuit diagram, explain the slip test on salient pole synchronous machines and indicate how X_d and X_Q can be determined from slip test. **(08 Marks)**

b. With a phasor diagram, explain the concept of two reaction theory in a salient pole synchronous machine. **(08 Marks)**

Module-5

9 a. Name the various methods for determining the voltage regulation for 3ϕ alternator and describe any one method in detail. **(08 Marks)**

b. A 2300V, 50Hz, 3ϕ star connected alternator has an effective armature resistance of 0.2Ω. A field current of 35A produces a current of 150A on short circuit and open circuit emf 780V (line). Calculate the voltage regulation at 0.8 pf lagging and 0.8pf leading for the full load current of 25A. **(08 Marks)**

OR

10 a. Write a note on capability curves of synchronous generator. **(05 Marks)**

b. What is hunting in synchronous machines? Explain the role of damper winding. **(05 Marks)**

c. With a neat sketch explain OCC and SCC characteristics of an alternator. **(06 Marks)**

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CBCS Scheme

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15EE34

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

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Design a collector to base bias circuit for the following specifications : $V_{CC} = 10V$, $V_{CE} = 5V$, $I_C = 1mA$, $\beta = 50$. If β varies from 25 to 75, find the change in collector current. **(07 Marks)**

b. What are the different biasing circuits? Find an expression for stability factor 'S' of each biasing circuit. **(09 Marks)**

OR

2 a. Design a voltage divider biasing circuit with a supply voltage of 10V and $V_{CE} = \frac{V_{CC}}{2}$. The load resistance is 2KΩ. Take $\beta = 100$. **(09 Marks)**

b. Explain the operation of transistor as switch along with suitable circuit and necessary waveforms. Highlight the design procedure. **(07 Marks)**

Module-2

3 a. Draw the circuit of common emitter amplifier with voltage divider biasing. Derive the expression for current gain, voltage gain, input and output impedance using the model. **(08 Marks)**

b. For the following circuit, find current gain, voltage gain, input and output impedance. **(08 Marks)**

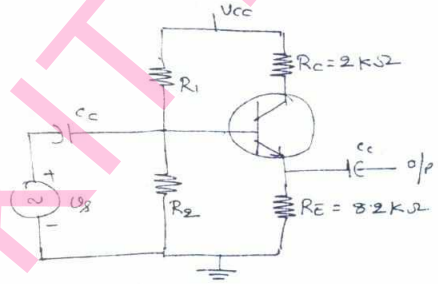

Fig.Q3(b)

$V_{CC} = 10V$
$R_1 = 47K\Omega$
$R_2 = 56K\Omega$
$R_E = 8.2K\Omega$
$\beta = 100$

OR

4 a. Starting from fundamentals, define h parameters and obtain an h – parameter equivalent circuit of common emitter configuration. **(08 Marks)**

b. Derive suitable expressions to explain the effect of cascading of amplifiers on lower and upper cut off frequencies. **(08 Marks)**

Module-3

5 a. What is a Cascade amplifier? Draw a practical circuit with cascade connection and derive the expressions for current gain, voltage gain, input and output impedance using r_e model. **(10 Marks)**

b. Explain the block diagram of a feedback amplifier. **(06 Marks)**

OR

6 a. Draw the circuit of Darlington emitter follower with voltage divider bias. Calculate input impedance, voltage gain and output impedance. Take $\beta_1 = \beta_2 = 100$. **(08 Marks)**
$R_1 = R_2 = 100K$, $R_E = 5k\Omega$. Take $r_e = 0.1K\Omega$.

b. Draw the block diagram of voltage series feedback amplifier and find the effect of feedback on input and output impedances. **(08 Marks)**

Module-4

7 a. Draw the circuit of class – A transformer coupled power amplifier. Explain the operation of the circuit with the help of neat waveforms. Also derive an expression for maximum efficiency of conversion. **(08 Marks)**

b. Draw the circuit of Wien bridge oscillator and derive an expression for frequency of oscillator. **(08 Marks)**

OR

8 a. Explain the classification of power amplifier with neat circuit diagram and waveforms of collector current and collector voltage for each type of power amplifier. **(10 Marks)**

b. Explain the principle of operation of oscillator and the effect of loop gain (Aβ) on the output of oscillator. **(06 Marks)**

Module-5

9 a. With the help of neat diagrams, explain the construction, working and characteristics of n – channel JFET. **(08 Marks)**

b. For the following circuit, find voltage gain and output impedance
i) If $r_d = 20K\Omega$ ii) If $r_d = \infty$. **(08 Marks)**

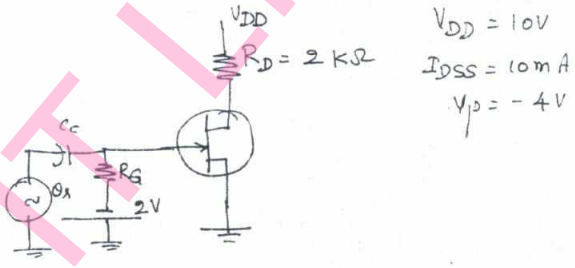

Fig.Q9(b)

OR

10 a. Explain the construction, working and characteristics of n – channel depletion MOSFET. **(08 Marks)**

b. Draw the circuit of common source amplifier using JFET, with the help of small signal model derive an expression for current gain, input impedance, voltage gain and output impedance. **(08 Marks)**

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15EE35

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
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. Simplify the following Boolean function using K-map.
$f(v, w, x, y, z) = \Sigma m (3, 7, 8, 10, 11, 12, 14, 15, 17, 19, 21, 23, 25, 27, 29, 31) + \Sigma d (2, 6, 26, 30)$. **(08 Marks)**

b. Simplify the boolean expression using a 3-variable VEM with 'd' as MEV.
$f(a, b, c, d) = \Sigma m (1, 3, 7, 11, 15) + \Sigma d (0, 2, 5)$. **(08 Marks)**

OR

2 a. Using Quine –McCluskey method, obtain a minimal sop expression of,
$f(w, x, y, z) = \pi m (0, 4, 5, 9) \cdot d (1, 7, 13)$. **(10 Marks)**

b. Find minimal sop expression using VEM with 'c' as MEV.
$f(a, b, c, d) = \Sigma m (3, 4, 5, 7, 8, 11, 12, 13, 15)$. **(06 Marks)**

Module-2

3 a. Realize the following Boolean function using a 8:1 MUX with wyz as select inputs.
$f(w, x, y, z) = \Sigma m (0, 1, 2, 5, 7, 8, 9, 12, 13)$. **(06 Marks)**

b. Design a 1-bit comparator using 2-4 decoder giving three outputs, G, E and L. **(04 Marks)**

c. Design a carry look ahead 4-bit parallel adder. Show that the time for addition is independent of the length of operands. **(06 Marks)**

OR

4 a. Implement a full subtractor using a 4:1 multiplexer. **(06 Marks)**

b. Design a 4 to 16 decoder by cascading 2 to 4 decoders. **(05 Marks)**

c. Explain a 4 to 2 line priority encoder with active high inputs and outputs using function table. **(05 Marks)**

Module-3

5 a. Analyse the application of SRFF as switch debouncer with waveforms. **(03 Marks)**

b. Applying 4-bit shift register, design a 4-bit twisted ring counter. **(05 Marks)**

c. Design a synchronous counter with counting sequence 3, 2, 5, 1, 0, 3 . . . . Using T.FF. **(08 Marks)**

OR

6 a. Explain race around condition. How is it eliminated? **(04 Marks)**

b. Design and implement a divide by -10 asynchronous counter using T-FFs. **(05 Marks)**

c. Design a synchronous counter to give a counting sequence 0, 2, 3, 1, 0 . . . using J.K FF. **(07 Marks)**

Module-4

7 a. Construct a sequential logic circuit with single input and single output by obtaining the state and excitation table for the given state diagram using JK FF. **(08 Marks)**

b. Analyze the following sequential circuit and obtain excitation, transition and state table. Also write the state diagram. **(08 Marks)**

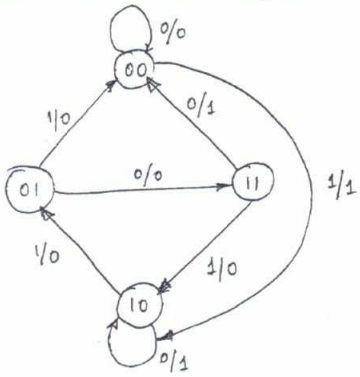

Fig Q7(a)

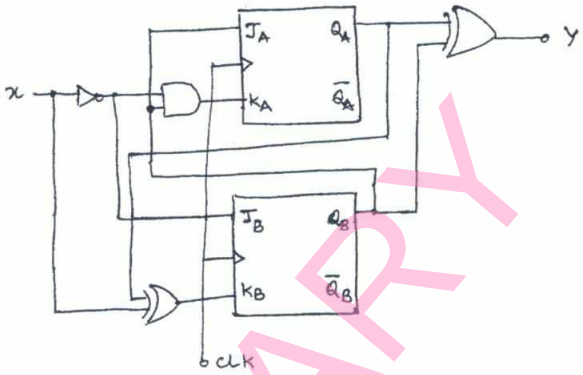

Fig Q7(b)

OR

8 a. By analyzing the sequential circuit obtain the equations for input a hence determine the excitation table, state table and state diagram. **(06 Marks)**

b. Design the sequential logic circuit for a single input and single output system from the state diagram using JKFF. Analyze through state table and excitation table. **(10 Marks)**

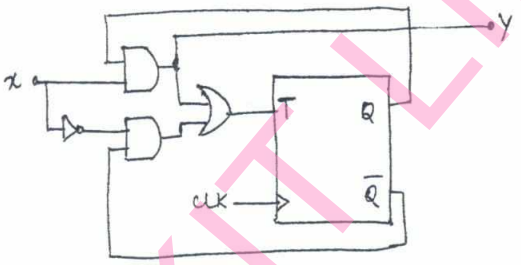

Fig Q8(a)

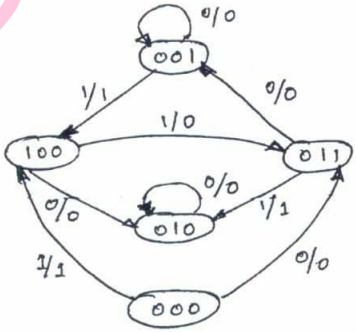

Fig Q8(b)

Module-5

9 a. Explain entity and architecture with reference to VHDL code of full adder circuit. **(06 Marks)**

b. Write VHDL code using a process and case statement to implement 4:1 multiplexer. **(04 Marks)**

c. Implement a T-FF with active low asynchronous inputs and clock input in VHDL. **(06 Marks)**

OR

10 a. Explain various data types available in VHDL. **(06 Marks)**

b. Implement a single – bit comparator for all input combinations in VHDL. **(04 Marks)**

c. Write VHDL code for edge triggered JKFF with active low asynchronous inputs. **(06 Marks)**

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CBCS Scheme

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

15EE36

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Electrical & Electronic Measurement

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive the dimensions of resistance, inductance and capacitance in LMTI systems. **(06 Marks)**

b. Define the sensitivity of wheat stone's bridge, with the necessary circuit diagram. Hence deduce the expression for sensitivity of the bridge 'SB'. **(06 Marks)**

c. Explain sources and detectors used in AC bridges. **(04 Marks)**

OR

2 a. Expression for mean torque of an electrodynamometer type of wattmeter is given by $T_d \alpha M^a E^b Z^C$.
M – Mutual inductance between fixed and moving coil.
E – applied voltage
Z – Impedance of load circuit.
Determine value of a, b and c using dimensional analysis. **(05 Marks)**

b. Derive the balancing equation for Kelvin's double bridge. **(06 Marks)**

c. A sheet of Bakelite 4.5 mm thick is tested at 50 Hz between electrodes 0.12 m in diameter. The schering bridge employs a standard air capacitor C_2 of 106 p.f. capacitance, a non reactive resistance R_4 of $\frac{1000}{\pi}\Omega$ in parallel with a variable capacitor C_4 and non-inductive variable resistance R_3. Balance is obtained with $C_4 = 0.5\ \mu F$ and $R_3 = 260\ \Omega$. Calculate the capacitance, power factor and relative permittivity of the sheet. **(05 Marks)**

Module-2

3 a. Derive the torque equation of single phase electrodynamometer type wattmeter. **(06 Marks)**

b. Explain the principle of operation of 10 W power factor wattmeter. **(06 Marks)**

c. If the reading on two wattmeters in 3-phase balanced load are 836 and 224 W, the latter reading being obtained after the reversal of current coil connections, calculate the power p.f. of the load. **(04 Marks)**

OR

4 a. Discuss the various adjustments required in energy meter for the accurate reading. **(06 Marks)**

b. A single phase kwhr meter makes 500 revolutions per kwhr. It is found on testing as making 40 revolutions in 58.1 seconds at 5 kw full load. Find out the percentage error. **(04 Marks)**

c. With the help of neat sketch, explain the construction and working of Weston frequency meter. **(06 Marks)**

Module-3

5 a. What is shunt? How it is used to extend the range of an ammeter? **(05 Marks)**

b. A moving coil meter gives a full scale deflection with a current of 5 mA. If the coil of the instrument has the resistance of 10 Ω, how it can be adopted to work as, (i) Ammeter of range 0 – 10 A (ii) Voltmeter of range (0 – 10 V). **(06 Marks)**

c. Write a note on turns compensation used in instrument transformers. **(05 Marks)**

OR

6 a. With neat circuit diagram, explain Silsbee's method of testing C.T. **(06 Marks)**
b. Explain the wattmeter method of measuring the iron loss. **(05 Marks)**
c. Explain Hop Kinson's permeameter. **(05 Marks)**

Module-4

7 a. With a block diagram, explain the working of a true R.M.S responding voltmeter. **(06 Marks)**
b. With a neat diagram, explain the working of an electronic multimeter. **(06 Marks)**
c. What are the errors in the measurement of Q-factor of a coil? Explain. **(04 Marks)**

OR

8 a. With a block diagram, explain the working of a Ramp type DVM. **(06 Marks)**
b. A coil with a resistance of 12 Ω is connected in the direct connection mode of Q meter. Resonance occurs when the oscillator frequency is 1 MHz and the resonating capacitor is set at 75 pf. Calculate the % error introduced in the calculated value of Q by the 0.02 Ω insertion resistance. **(05 Marks)**
c. With a neat block diagram, explain the principle of working of electronic energy meter. **(05 Marks)**

Module-5

9 a. Explain LED and LCD displays. **(08 Marks)**
b. Write a short note on nixie tube. **(04 Marks)**
c. Write a short note on stripchart recorder. **(04 Marks)**

OR

10 a. With a neat sketch, explain the working of a X-Y recorder. **(06 Marks)**
b. With the help of neat block diagram, explain ECG machine. Write important features of ECG machine. **(08 Marks)**
c. Write the features of EEG. **(02 Marks)**

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CBCS Scheme

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15MATDIP31

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Simplify $\frac{(\cos 3\theta - i\sin 3\theta)^2(\cos 4\theta + i\sin 4\theta)^5}{(\cos\theta + i\sin\theta)^3(\cos 2\theta - i\sin 2\theta)^4}$. **(06 Marks)**

b. Determine λ such that $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - 4\hat{k}$ and $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar. **(05 Marks)**

c. Find sine angle of two vectors $4\hat{i} + 3\hat{j} + \hat{k}$ and $2\hat{i} - \hat{j} + 2\hat{k}$. **(05 Marks)**

OR

2 a. Express $\frac{1}{2+i} - \frac{(1+i)^2}{3+i}$ in the form a + ib. **(06 Marks)**

b. Find modulus and amplitude of $1 + \cos\theta + i\sin\theta$. **(05 Marks)**

c. If $\vec{a} = 3\hat{i} + 7\hat{j} - 2\hat{k}$, $\vec{b} = 2\hat{i} + 5\hat{j} + 10\hat{k}$ find $(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b})$. **(05 Marks)**

Module-2

3 a. If $y = a\cos(\log x) + b\sin(\log x)$ show that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$. **(06 Marks)**

b. With usual notation prove that $\tan\varphi = r\frac{d\theta}{dr}$. **(05 Marks)**

c. If $u = e^{ax+by} f(ax - by)$ prove that $b\frac{\partial u}{\partial x} + a\frac{\partial u}{\partial y} = 2abu$. **(05 Marks)**

OR

4 a. Find n^{th} derivative of $y = e^x \sin 4x \cos x$ **(06 Marks)**

b. Find pedal equation of $r = a(1 + \cos\theta)$. **(05 Marks)**

c. If $u = f(x - y, y - z, z - x)$ show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. **(05 Marks)**

Module-3

5 a. Evaluate $\int_0^{\pi} \sin^5(x/2)dx$. **(06 Marks)**

b. Evaluate $\int_0^{2a} x^2\sqrt{2ax - x^2}\,dx$. **(05 Marks)**

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

OR

6 a. Evaluate $\int_0^a \frac{x^3 dx}{\sqrt{a^2 - x^2}}$. **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y \, dx \, dy$. **(05 Marks)**

c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} \, dz \, dy \, dx$. **(05 Marks)**

Module-4

7 a. A particle moves along the curve c : $x = t^3 - 4t$, $y = t^2 + 4t$, $z = 8t^2 - 3t^3$ where t denotes time. Find velocity and acceleration at t = 2. **(06 Marks)**

b. Find unit normal vector to surface $Q = x^2yz + 4xz^2$ at (1, -2, -1). **(05 Marks)**

c. Show that $\vec{f} = (2xy^2 + yz)\hat{i} + (2x^2y + xz + 2yz^2)\hat{j} + (2y^2z + xy)\hat{k}$ is irrotational. **(05 Marks)**

OR

8 a. A particle moves along the curve c : $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$ where 't' is the time. Find the components of velocity and acceleration at t = 1 in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$. **(06 Marks)**

b. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at (2, -1, 2). **(05 Marks)**

c. If $\phi = 2x^3y^2z^4$ find div(gradϕ). **(05 Marks)**

Module-5

9 a. Solve : $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$. **(06 Marks)**

b. Solve : $x^2y \, dx - (x^3 + y^3) \, dy = 0$. **(05 Marks)**

c. Solve : $(y^3 - 3x^2y) \, dx - (x^3 - 3xy^2) \, dy = 0$. **(05 Marks)**

OR

10 a. Solve : $\frac{dy}{dx} = \frac{y}{x} + \sin\left(\frac{y}{x}\right)$. **(06 Marks)**

b. Solve : $(x^2 + y^2 + x)dx + xy \, dy = 0$. **(05 Marks)**

c. Solve : $\frac{dy}{dx} + y \cot x = \cos x$. **(05 Marks)**

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