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10MAT31

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

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Obtain the Fourier Series for the function,

$$f(x) = \begin{cases} \pi x & \text{in } 0 \le x \le 1 \\ \pi(2-x) & \text{in } 1 \le x \le 2 \end{cases}.$$

(07 Marks)

b. Find the cosine half range series for $f(x) = x(l-x)$; $0 \le x \le l$. **(06 Marks)**

c. Obtain the Fourier series of y upto the second harmonics for the following values: **(07 Marks)**

x^0	45	90	135	180	225	270	315	360
y	4.0	3.8	2.4	2.0	-1.5	0	2.8	3.4

2 a. Find the Fourier transform of $f(x) = e^{-|x|}$. **(07 Marks)**

b. Find the Fourier sine transform of $f(x) = \dfrac{1}{x(1+x^2)}$. **(06 Marks)**

c. Find the Fourier cosine transform of e^{-ax} and deduce that

$$\int_0^\infty \frac{\cos mx}{a^2+x^2}\,dx = \frac{\pi}{2a}e^{-am}.$$

(07 Marks)

3 a. Obtain the various possible solution of one-dimensional wave equation $u_{tt} = C^2 u_{xx}$ by the method of separation of variables. **(07 Marks)**

b. A tightly stretched string with fixed end points x = 0 and x = l is initially at rest in its equilibrium position. If each of its points is given a velocity $\lambda x(l-x)$. Find the displacement of the string at any distance x from one end at any time t. **(06 Marks)**

c. Solve the Laplace equation, $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$

subject to the conditions u(0, y) = u(l, y) = u(x, 0) = 0 and u(x, a) = $\sin\dfrac{n\pi x}{l}$. **(07 Marks)**

4 a. Predict the mean radiation dose at an altitude of 3000 feet by fitting an exponential curve to the given data using $y = ab^x$ **(07 Marks)**

Altitude (x) :	50	450	780	1200	4400	4800	5300
Dose of radiation (y) :	28	30	32	36	51	58	69

b. Using graphical method solve the LPP,

Maximize $z = 50x_1 + 60x_2$,

Subject to the constraints : $2x_1 + 3x_2 \le 1500$,

$3x_1 + 2x_2 \le 1500$,

$0 \le x_1 \le 400$,

$0 \le x_2 \le 400$,

$x_1 \ge 0,\ x_2 \ge 0$. **(06 Marks)**

c. Solve the following minimization problem by simplex method:
Objective function : $P = -3x + 8y - 5z$
Constraints : $-x - 2z \le 5$,
$2x - 3y + z \le 3$,
$2x - 5y + 6z \le 5$,
$x_1, x_2, x_3 \ge 0$. **(07 Marks)**

PART – B

5 a. Using Newton-Raphson iterative formula find the real root of the equation $x \log_{10} x = 1.2$. Correct to five decimal places. **(07 Marks)**

b. Solve, by the relaxation method, the following system of equations:
$9x - 2y + z = 50$
$x + 5y - 3z = 18$
$-2x + 2y + 7z = 19$. **(06 Marks)**

c. Using the Rayleigh's power method find the dominant eigen value and the corresponding eigen vector of the matrix, $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ taking $[1, 1, 1]^T$ as the initial eigen vector. Peform five iterations. **(07 Marks)**

6 a. The population of a town is given by the table. Using Newton's forward and backward interpolation formulae, calculate the increase in the population from the year 1955 to 1985. **(07 Marks)**

Year	1951	1961	1971	1981	1991
Population in thousands	19.96	39.65	58.81	77.21	94.61

b. The observed values of a function are respectively 168, 120, 72 and 63 at the four positions 3, 7, 9, 10 of the independent variable. What is the best estimate you can give for the value of the function at the position 6 of the independent variable? Use Lagrange's method. **(06 Marks)**

c. Use Simpson's $\left(\frac{3}{8}\right)^{th}$ Rule to obtain the approximate value of $\int_0^{0.3} (1 - 8x^3)^{\frac{1}{2}} dx$ by considering 3 equal intervals. **(07 Marks)**

7 a. Solve numerically the wave equation $u_{xx} = 0.0625 u_{tt}$ subject to the conditions, $u(0, t) = 0 = u(5, t)$, $u(x, 0) = x^2(x - 5)$ and $u_t(x, 0) = 0$ by taking $h = 1$ for $0 \le t \le 1$. **(07 Marks)**

b. Solve : $u_{xx} = 32 u_t$ subject to the conditions, $u(0, t) = 0$, $u(1, t) = t$ and $u(x, 0) = 0$. Find the values of u upto $t = 5$ by Schmidt's process taking $h = \frac{1}{4}$. Also extract the following values:
(i) $u(0.75, 4)$ (ii) $u(0.5, 5)$ (iii) $u(0.25, 4)$ **(06 Marks)**

c. Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ in the square region shown in the following Fig. Q7 (c), with the boundary values as indicated in the figure. Carry out two iterations. **(07 Marks)**

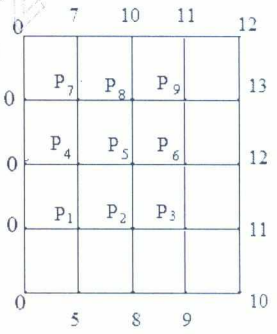

Fig. Q7 (c)

8 a. State initial value property and final value property. If $\bar{u}(z)=\frac{2z^2+3z+4}{(z-3)^3}$, $|z|>3$. Find the values of u_1, u_2, u_3. **(07 Marks)**

b. Obtain the inverse z-transform of the function,

$$\frac{4z^2-2z}{z^3-5z^2+8z-4}.$$

(06 Marks)

c. Solve the difference equation, $y_{n+1}+\frac{1}{4}y_n=\left(\frac{1}{4}\right)^n$, $(n\geq 0)$, $y_0=0$ by using z-transform method. **(07 Marks)**

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10ES32

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

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Assuming an ideal diode, sketch v_i, v_d and i_d for half-wave rectifier of Fig.1(a). The input is a sinusoid with frequency 50 Hz. **(08 Marks)**

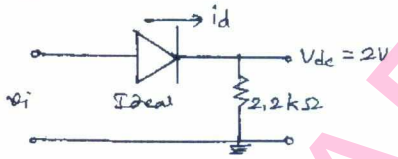

Fig.Q1(a)

b. Determine v_0 for the network shown in Fig.Q1(b). **(06 Marks)**

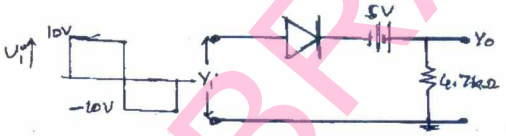

Fig.Q1(b)

c. Sketch v_0 for the network shown in Fig.Q1(c). **(06 Marks)**

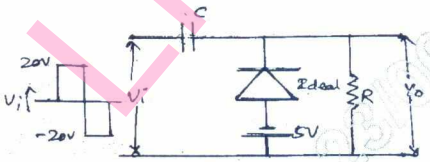

Fig.Q1(c)

2 a. Using exact analysis, obtain the Q-point values for the voltage-divider bias circuit. **(08 Marks)**

b. Obtain the expression for $S(I_{co})$ for an emitter-bias circuit and determine its value for the circuit with $R_B = 470\ k\Omega$, $R_E = 2.2k\Omega$, $R_C = 3.3k\Omega$, $V_{CC} = 12V$ and $\beta = 100$. **(06 Marks)**

c. For the circuit shown in Fig.Q2(c), determine the values for R_1 and R_C. **(06 Marks)**

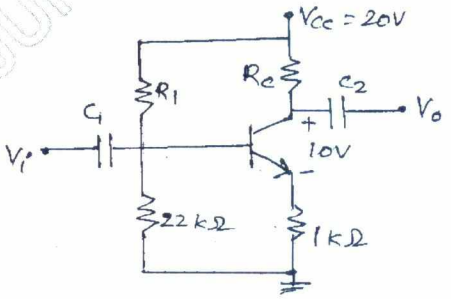

Fig.Q2(c)

3 a. Derive the equations for Z_i, Z_0 and A_V for fully by passed common emitter RC–coupled amplifier. **(08 Marks)**

b. Compare Z_i, Z_0 and A_V of a RC coupled amplifier with emitter follower and explain why emitter follower is called as impedance matching network. **(06 Marks)**

c. For the circuit shown in Fig.Q3(c), find Z_i, Z_0 and A_V. **(06 Marks)**

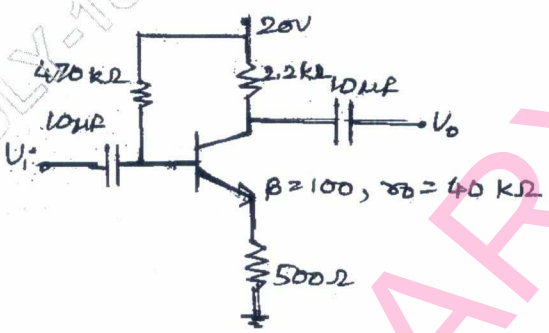

Fig.Q3(c)

4 a. Draw the frequency of RC coupled amplifier and explain high-pass action at low frequencies and low-pass action at high frequencies with relevant equations and Bode plots. **(08 Marks)**

b. Draw the high frequency equivalent circuit for RC coupled amplifier and obtain expressions for f_{Hi} and f_{H0}. **(06 Marks)**

c. Determine f_{C_S} and f_{C_C} for circuit with,

$C_S = 10\mu F$, $C_E = 20\ \mu F$, $C_C = 1\ \mu F$, $R_S = 1k\Omega$, $R_1 = 40k\Omega$, $R_2 = 10\ k\Omega$, $R_E = 2k\Omega$, $R_C = 4k\Omega$, $R_L = 2.2k\Omega$, $\beta = 100$, $r_0 = \infty$, $V_{CC} = 20V$. **(06 Marks)**

PART – B

5 a. Explain the advantages of employing negative feedback in an amplifier. **(06 Marks)**

b. Derive an equation for Z_i and A_V for a Darlington emitter follower. **(08 Marks)**

c. For cascaded stages shown in Fig.Q5(c), determine :

i) Loaded gain for each stage

ii) Total gain for the system A_V and A_{VS}. **(06 Marks)**

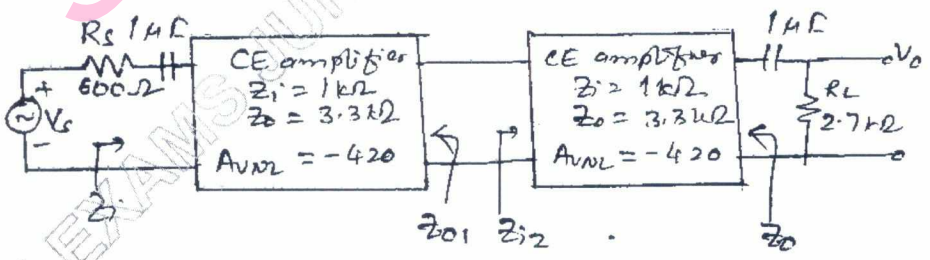

Fig.Q5(c)

6 a. Derive the expression for maximum percentage efficiency for a seriesfed class–A power amplifier. **(08 Marks)**

b. Calculate the second harmonic distortion for an output waveform with $V_{CE_Q} = 10V$, $V_{CE_{min}} = 1V$, $V_{CE_{max}} = 18V$. **(06 Marks)**

c. Draw the circuit of a class-B push-pull amplifier and explain the working. Explain why cross-over distortion occurs in class-B and how it is overcome. **(06 Marks)**

7 a. With a neat circuit diagram, explain the principle of operation of RC phase-shift oscillator with necessary equations. **(08 Marks)**

b. Explain the working of transistor crystal oscillator in series resonant mode. **(06 Marks)**

c. Design a Weinbridge oscillator for a frequency of 4KHz. **(06 Marks)**

8 a. Derive equations for Z_i, Z_0 and A_V for JFET fixed bias configuration, with source resistor bypassed. **(08 Marks)**

b. For JFET amplifier shown in Fig.Q8(b), find Z_i, Z_0 and A_V. **(08 Marks)**

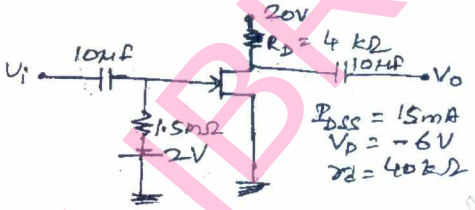

Fig.Q8(b)

c. Explain the graphical determination of g_m. **(04 Marks)**

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10ES33

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

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Reduce the following function using K-Map technique and implement using gates :
$J = f(A, B, C, D, E) = \Sigma_m (4, 5, 6, 7, 9, 11, 13, 15, 25, 27, 29, 31)$
$G = f(A, B, C, D) = \pi M(0, 4, 5, 7, 8, 9, 11, 12, 13, 15)$. **(12 Marks)**

b. Fig.Q1(b) shows a BCD counter that produces a 4-bit output representing the BCD code for the number of pulses that have been applied to the counter input. The counter resets to "0000" on the tenth pulse and starts recounting. Design the logic circuit that produces a "High" output whenever the count is 2, 3, or 9. Use K–Mapping and implement the logic circuit using NAND gates. **(08 Marks)**

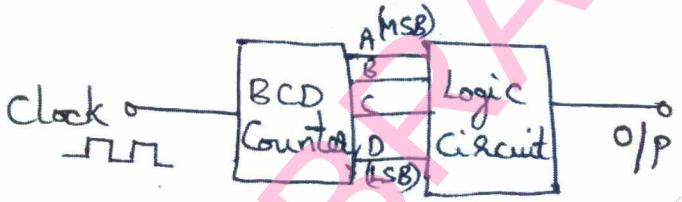

Fig.Q1(b)

2 a. Convert the given Boolean function $f(x, y, z) = [x + \bar{x}\,\bar{z}(y + \bar{z})]$ into maxterm canonical form and hence highlight the importance of canonical formula. **(06 Marks)**

b. Simplify using Quine Mc Cluskey tabulation algorithm.
$v = f(a, b, c, d) = \Sigma(2, 3, 4, 5, 13, 15) + \Sigma d(8, 9, 10, 11)$. **(14 Marks)**

3 a. Implement a full subtractor using decoder and write the truth table. **(10 Marks)**

b. What are the problems associated with the basic encoder? Explain how they can be overcone by priority encoder, considering 8 input lines. **(10 Marks)**

4 a. Design a combinational circuit that accepts two unsigned, 2-bit binary number $A = A_1\ A_0$ and $B = B_1\ B_0$ and provide 3 outputs corresponding to A = B, A > B and A < B. **(08 Marks)**

b. Implement f(a, b, c, d) = Σm(0, 1, 5, 6, 7, 9, 10, 15) using :
i) 8 : 1 MUX with a, b, c as select line
ii) 4 : 1 MUX with a, b as select lines. **(08 Marks)**

c. Explain the terms :
i) Ripple–carry propagation
ii) Look–ahead carry. **(04 Marks)**

PART – B

5 a. What is a flip-flop? Discuss the working principle of S-R flip-flop with its truth table. Also explain the role of S-R latch in switch debouncer circuit. **(08 Marks)**

b. With neat schematic diagram of master slave JK-FF, discuss its operation. Mention the advantages of JK-FF over master slave SR-FF. **(12 Marks)**

6 a. Design a 4-bit universal shift register using positive edge triggered D-flip-flops to operate as shown in table below TableQ6(a). **(12 Marks)**

Select line		Data line selected	Register Operation
S_1	S_0		
0	0	I_0	Hold
0	1	I_1	Shift right
1	0	I_2	Shift left
1	1	I_3	Parallel load

Table Q6(a)

b. Explain the working of a 4-bit asynchronous DeCade counter using JKFF in toggel mode. **(08 Marks)**

7 a. Explain mealy and Moore sequential circuit models. **(04 Marks)**

b. For the state machine M_1 shown in Fig.Q7(b) obtain,

i) State table
ii) Transition table
iii) Excitation table for T flip-flop
iv) Logic circuit for T excitation realization. **(16 Marks)**

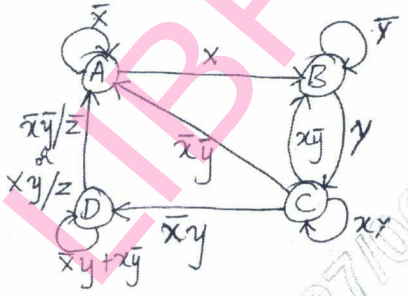

Fig.Q7(b)

8 a. Construct Moore and Mealy state diagram that will detect input sequence 10110, when input pattern is detected Z is asserted high. Give state algorithms for each state. **(10 Marks)**

b. Design a cyclic Mod6, synchronous binary counter using J-K flip-flop. Give the state diagram, transition table and excitation table. **(10 Marks)**

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10ES34

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Network Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following terms with examples :
i) Lumped Element ii) Active Element iii) Practical Source. **(03 Marks)**

b. Find the current I_3 using mesh analysis for the circuit shown in fig.Q1(b), if the circuit is operating at frequency 5000 rad/s. **(07 Marks)**

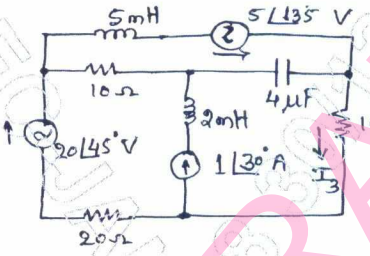


Fig.Q1(b)

c. For the circuit shown in fig. Q1(c), find the power delivered by dependent source using node analysis. **(06 Marks)**

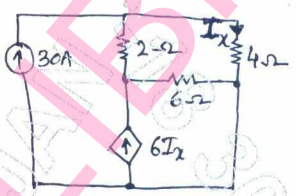


Fig.Q1(c)

d. Find the resistance R_{AB} for the network shown in fig.Q(d), using Δ - Y conversion. **(04 Marks)**

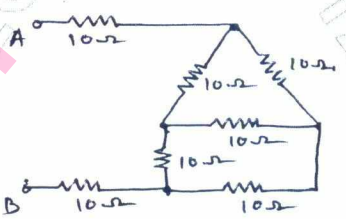


Fig.Q1(d)

2 a. Define the following terms with example :
i) Graph ii) Tree iii) Co - tree. **(03 Marks)**

b. For the circuit in fig.Q2(b), write the tie – set matrix using AB, BC and CA or the links of the tree. Obtain the equilibrium equations in matrix from using KVL and calculate all loop currents and branch voltages. **(10 Marks)**

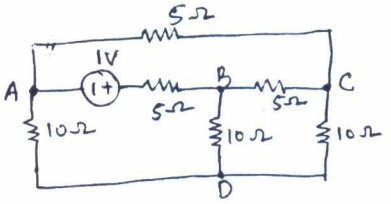
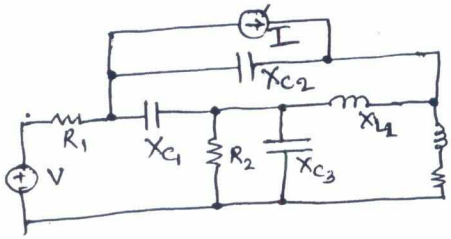


Fig.Q2(b)

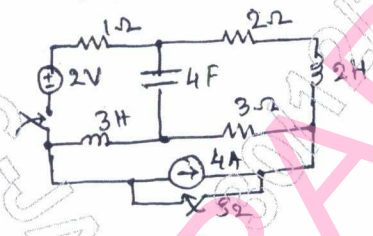
c. Draw the oriented graph for the circuit shown in fig.Q2(c). Also find fundamental cut – set schedule using X_{c1} , R_2 and X_{L1} or the twigs of the tree. Find admittance matrix also. **(04 Marks)**

Fig.Q2(c)



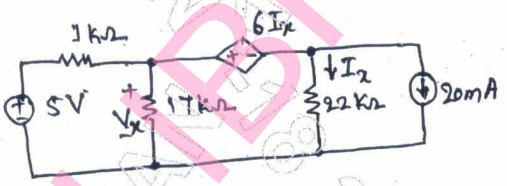
d. Find the dual of the circuit shown in fig.Q2(d). **(03 Marks)**

Fig.Q2(d)



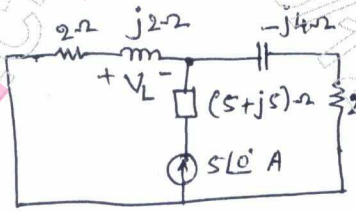
3 a. Find V_x using superposition for the circuit shown in fig.Q3(a). **(08 Marks)**

Fig.Q3(a)



b. Find the voltage V_L across the inductor and verify reciprocity theorem for the circuit shown in Fig.Q3(b). **(06 Marks)**

Fig.Q3(b)



c. State and prove Milliman's theorem. **(06 Marks)**

4 a. Find the Thevenin's equivalent circuit across terminals a & b for the circuit shown in fig.Q4(a). Also find the current I_L using this equivalent circuit. **(08 Marks)**

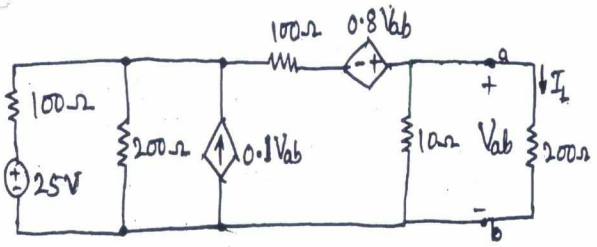
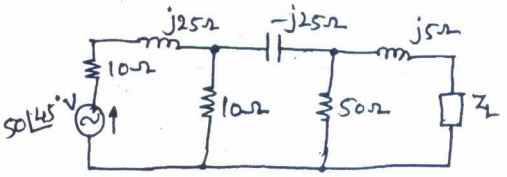


Fig.Q4(a)

b. State and prove Norton's theorem. **(05 Marks)**

c. Find Z_L for maximum power transfer for the circuit shown in fig.Q4(c). And also find the average maximum power absorbed by Z_L. **(07 Marks)**

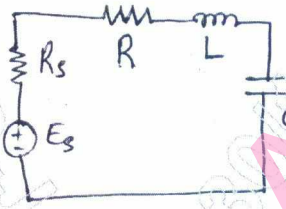
Fig.Q4(c)



PART – B

5 a. For the circuit shown in fig.Q5(a), find the transfer function, resonant frequency half power frequencies , bandwidth and Q - factor. **(10 Marks)**

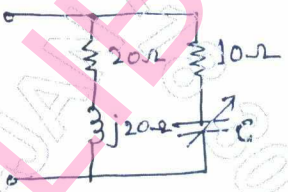
Fig.Q5(a)



b. Define the term Q – factor. Using this definition find the Q – factor of an inductor and a capacitor. **(05 Marks)**

c. For the network shown in fig.Q5(c), find the value of C for resonance to take place at w = 5000 rad/s. **(05 Marks)**

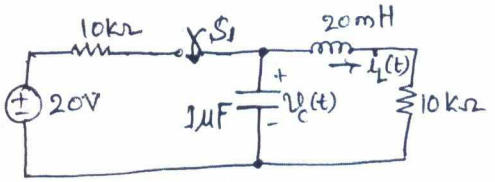
Fig.Q5(c)



6 a. Write a short note on Initial and Final conditions of circuit elements under switching conditions. **(06 Marks)**

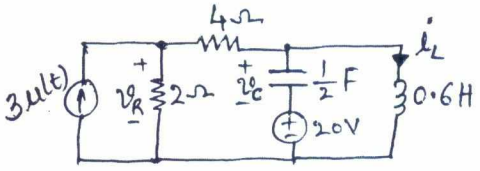
b. In the circuit shown in fig.Q6(b), the switch S_1 has been open for a long time before closing at t = 0. Find $V_c(0^+)$, $i_L(0^+)$, $Vc(\infty)$, $i_L(\infty)$, $\frac{di_L}{dt}(0^+)$ and $\frac{d^2i_L}{dt^2}(0^+)$. **(06 Marks)**

Fig.Q6(b)



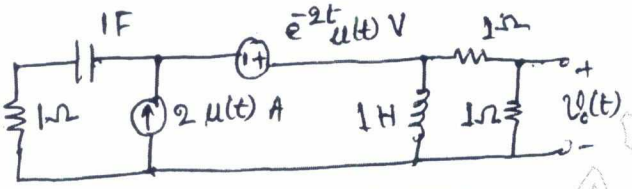
c. For the circuit shown in fig.Q6(c), calculate $i_L(0^+)$ $\frac{di_L(0^+)}{dt}$, $\frac{d}{dt}V_c(0^+)$, $V_R(\infty)$, $V_c(\infty)$ and $i_L(\infty)$ **(08 Marks)**

Fig.Q6(c)



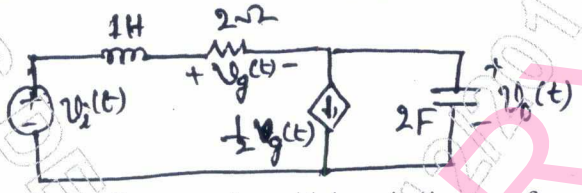
7 a. Find $V_o(t)$ of the circuit shown in fig.Q7(a). **(10 Marks)**

Fig.Q7(a)



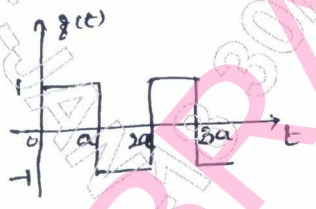
b. Find the impulse response of the circuit shown in fig.Q7(b). **(06 Marks)**

Fig.Q7(b)



c. Find the Laplace Transform of non – sinusoidal periodic waveform shown in fig.Q7(c). **(04 Marks)**

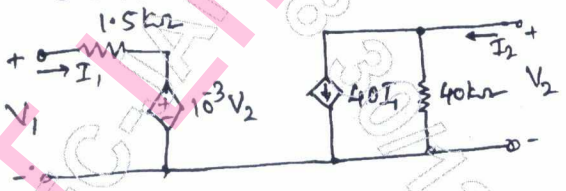
Fig.Q7(c)



8 a. Find the Z – transform in terms of Y - parameters. **(04 Marks)**

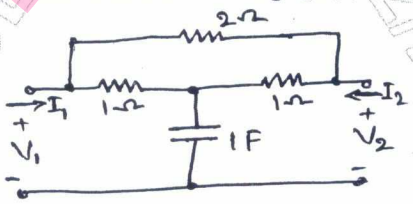
b. For the network shown in fig.Q8(b), find the transmission line parameters. **(08 Marks)**

Fig.Q8(b)



c. Find the h – parameters of the network shown in fig.Q8(c). **(08 Marks)**

Fig.Q8(c)



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10EE35

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

Electrical and Electronic Measurements and Instrumentation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define bridge sensitivity and hence obtain an expression for Wheatstone's bridge sensitivity (S_B) in terms of voltage sensitivity. **(08 Marks)**

b. The expression for mean torque of an electrodynamometer type of Wattmeter may be written as $T \propto M^p E^q Z^r$, where M = mutual inductance between fixed and moving coils, E = applied voltage, Z = impedance of load circuit. Determine the values of p, q and r from the dimensions of the quantities. **(06 Marks)**

c. Derive the dimensions of reluctance, energy and resistance in LMTI system of units. **(06 Marks)**

2 a. Derive the equations of balance for Hay's bridge. Also draw the phasor diagram for it. **(08 Marks)**

b. An Anderson bridge has the following branches:
Arm ab = an unknown impedance (R_1, L_1) in series with a non-inductive variable resistor r_1.
Arm bc = a non-inductive resistor $R_3 = 100\ \Omega$
Arm cd = a non-inductive resistor $R_4 = 200\ \Omega$
Arm da = a non-inductive resistor $R2 = 250\ \Omega$
Arm de = a non-inductive variable resistor r.
Arm ec = lossless capacitor $C = 1\ \mu F$ and
Arm be = a detector
An AC supply is connected between a and c. Calculate resistance R_1 and inductance L_1 under balance condition. $r_1 = 43.1\ \Omega$ and $r = 229.7\ \Omega$. **(06 Marks)**

c. Explain the purpose of shielding of bridges. Describe with sketch, Wagner's ground connection for shielding of bridges. **(06 Marks)**

3 a. A current transformer with 5 primary turns has a secondary resistance of 0.16 Ω and inductive reactance of 0.12 Ω. Given that the primary current is 200 A, the magnetizing current is 1.5 A and the iron loss current is 0.4 A, determine the number of secondary turns needed to make the current ratio 100:1, and the phase angle under these conditions. **(10 Marks)**

b. A moving coil instrument gives a full scale reading of 50 mA, when the potential difference across its terminals is 150 mV. Show how it can be used to measure a current of 200 A and a voltage of 1000 V. **(06 Marks)**

c. Compare potential transformer and current transformer. **(04 Marks)**

4 a. With a neat sketch describe single-phase induction type energy meter. **(08 Marks)**

b. A wattmeter has a current coil of resistance 0.2 Ω and a pressure coil of resistance 5000 Ω is connected to measure the power consumed by a load. Calculate the percentage error in the reading of the wattmeter, when the load takes 20 A at 250 V with 0.8 power factor, when
i) the pressure coil is connected on the supply side
ii) the current coil is connected on the supply side
iii) What load current would give equal errors with the two connections? **(06 Marks)**

c. Discuss the adjustments required in energymeter for accurate reading. **(06 Marks)**

PART – B

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

b. Explain the operation of successive approximation digital voltmeter with the help of block diagram. **(07 Marks)**

c. Explain the direct connection method of measuring Q with the help of a diagram. **(07 Marks)**

6 a. With the help of block diagram, explain dual trace oscilloscope. **(07 Marks)**

b. With a neat block diagram, explain digital storage oscilloscope. **(07 Marks)**

c. Explain the measurement of frequency using Lissajous patterns. **(06 Marks)**

7 a. Explain with a neat sketch, the construction and working of a linear variable differential transformer. **(08 Marks)**

b. Derive the expression for gauge factor for a strain gauge. **(06 Marks)**

c. With diagram explain photo conductive and photovoltaic cells. **(06 Marks)**

8 a. Explain with a block diagram, the essential functional operation of a digital data acquisition system. **(08 Marks)**

b. Explain the working of function generator with the help of a neat diagram. **(06 Marks)**

c. Explain with the help of a diagram, the operation of x-y recorders. **(06 Marks)**

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USN 1 K T 1 4 E E 0 3 8 **10EE36**

Third Semester B.E. Degree Examination, June/July 2018
Electric Power Generation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a schematic diagram, explain the working of a solar power plant. **(06 Marks)**

b. What is co-generation? Explain types of co-generation system. **(06 Marks)**

c. With a neat sketch explain the wind power plant. **(08 Marks)**

2 a. Discuss the concept of distributed generation and briefly explain the chief areas for distributed generation. **(08 Marks)**

b. State any eight advantages of gas–turbine plant over steam power plant. **(08 Marks)**

c. Write the comparision of open-cycle and closed cycle gas turbine plant. **(04 Marks)**

3 a. What are the factors to be considered while selecting a site for hydro electric plants? **(06 Marks)**

b. Classify the hydroelectric plants based on the available head. **(06 Marks)**

c. Explain briefly the following parts of a steam power plants i) boiler ii) economizers iii) turbines iv) super-heaters. **(08 Marks)**

4 a. Enumerate the pros and cons of nuclear power generation. **(06 Marks)**

b. Explain the main components of nuclear reactor and discuss the classification of reactors. **(14 Marks)**

PART – B

5 a. Define the following terms :
i) Demand factor
ii) Plant capacity factor
iii) Plant use factor
iv) Utilization factor. **(08 Marks)**

b. A generating station has 3×50 mw units. The station output is 876×10^6 Kwh per annum. The maximum demand is 120 Mw. Calculate : i) average load on the station ii) annual load factor iii) annual plant capacity factor iv) plant utilization factor. **(08 Marks)**

c. Write a brief note on load curve. **(04 Marks)**

6 a. What are the main causes of low power factors and mention the measures by which low power factor can be avoided. **(10 Marks)**

b. Explain power factor tariff. **(02 Marks)**

c. Load factor of a consumer is 35% and the monthly consumption is 504 Kwh. If the rate of electricity is Rs. 180 per kw of maximum demand plus Rs. 2.00 per kwh, find i) the monthly bill and the average cost per Kwh ii) the overall cost per Kwh if the consumption is increased by 20% with the same load factor iii) the overall cost per Kwh if the consumption remains same but load factor is increased to 40%. **(08 Marks)**

7 a. Explain the need for grounding briefly. **(06 Marks)**

b. Explain the importance and necessity for grounding in an electrical installation. List the different types of grounding. **(08 Marks)**

c. Explain an ungrounded system in a power system. **(06 Marks)**

8 a. With a schematic arrangement and phasor diagram explain solid grounding. **(10 Marks)**

b. Explain Arc suppression coil. **(04 Marks)**

c. Determine the value of inductance of arc suppressor coil to be connected between the neutral and ground to neutralize the charging current of overhead line having the line to ground capacitance equal to 0.2 μF. If the supply frequency is 50Hz and the operating voltage is 132KV. Find the KVA rating of the coil. **(06 Marks)**

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MATDIP301

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

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Find modulus and amplitude of : $z = \frac{(1+i)^2}{1-i}$. **(06 Marks)**

b. Prove that :
$(1+\cos\theta+i\sin\theta)^n + (1+\cos\theta-i\sin\theta)^n = 2^{nH}\cos^n\frac{\theta}{2}\cos\frac{n\theta}{2}$. **(07 Marks)**

c. If $x = \cos\theta + i\sin\theta$ and $y = \cos\phi + i\sin\phi$, then prove that $\frac{x-y}{x+y} = i\tan\left(\frac{\theta-\phi}{2}\right)$. **(07 Marks)**

2 a. Find the n^{th} derivative of $y = e^{ax}\cos(bx+c)$. **(06 Marks)**

b. If $y = e^{m\sin^{-1}x}$ then prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+m^2)y_n = 0$. **(07 Marks)**

c. Expand $\log(1+\sin x)$ in powers of x, by using Maclaurin's theorem. **(07 Marks)**

3 a. If $z = e^{ax+by}f(ax-by)$, then show that $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$. **(06 Marks)**

b. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. **(07 Marks)**

c. If $u = \tan^{-1}x + \tan^{-1}y$ and $v = \frac{x+y}{1-xy}$ find $\frac{\partial(u,v)}{\partial(x,y)}$ **(07 Marks)**

4 a. With usual notation, prove that $\tan\phi = r\frac{d\theta}{dr}$. **(06 Marks)**

b. Find the angle between the curves $r = a(1-\cos\theta)$ and $r = 2a\cos\theta$. **(07 Marks)**

c. Find the pedal equation of the curve $r = a(1+\cos\theta)$. **(07 Marks)**

5 a. Obtain the reduction formula for $\int \sin^n x\,dx$, where n is a positive integer. **(06 Marks)**

b. Evaluate $\int_0^1 \frac{x^9}{\sqrt{1-x^2}}dx$. **(07 Marks)**

c. Evaluate $\int_0^{\log 2}\int_0^x\int_0^{x+y} e^{x+y+z}dz\,dy\,dx$. **(07 Marks)**

6 a. Prove that $\left[\frac{1}{2}\right] = \sqrt{\pi}$. **(06 Marks)**

b. Show that $\int_0^{\pi/2} \sqrt{\sin\theta}\, x \int_0^{\pi/2} \frac{1}{\sqrt{\sin\theta}}\, d\theta = \pi$. **(07 Marks)**

c. Evaluate $\int_0^{\infty} \frac{dx}{1+x^4}$ in terms of Beta functions. **(07 Marks)**

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

b. Solve $xdy - ydx = \sqrt{x^2+y^2}\ dx$. **(07 Marks)**

c. Solve $(x^2 - 4xy - 2y^2)\,dx + (y^2 - 4xy - 2x^2)\,dy = 0$. **(07 Marks)**

8 a. Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x} + \cos 2x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x \cos x$. **(07 Marks)**

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