MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)

Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Probability Theory and Stochastic Processes**

Branch: **ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I.   Answer **ALL** questions of the following   5x1Mark=5 Marks

1. Define conditional probability?

2. It is possible to define a continuous Random variable on a discrete sample space? If yes, Give an example.

3. Define Joint Cumulative Distribution Function

4. Define mean ergodic process?

5. State any two uses of spectral density.

II.   Answer **ALL** questions of the following   10x2Marks=20 Marks

1. Let A and B be two independent events in S. It is known that P(A n B) = 0.16 and P(A U B) = 0.64. Find P(A) and P(B).

2. What are the conditions to be satisfied for the statistical independence of three events A, B and C?

3. Define Gaussian density and Uniform density functions.

4. Write any two properties of density function?
5. Define Jointly Gaussian Random Variable

6. State Joint Characteristic Function.

7. Differentiate Time Average & Statistical Average.

8. Derive the power spectral density at zero frequency is equal to the area under the curve of the autocorrelation Rxx(τ)?

9. What do you mean by Weiner-Khinchinn Relationship?

10. Write any three properties of a Cross power Density Spectrum.

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks

1. a. State and Prove Baye's Theorem   (6M)

   b. An urn contains 8 white balls and 4 red balls. The experiment consists of drawing 2 balls from the urn without replacement. Find the probability that both balls drawn are white.   (4M)

OR

2. a) Define probability based on set theory and fundamental axioms?

   b) Two boxes are selected randomly. The first box contains 2 black balls and3 white balls. Second box contains 4 white and 6 black balls. What is the probability of drawing a white ball?

3. a. The Density function of a random variable X is $g(X) = \begin{cases} 5\,e - 5x\ 0 < X < \\ 0 \text{ elsewhere} \end{cases}$

find i) $E[(X-1)^2]$ ii) $E[3X-1]$

b. Find the moment generating function of the random variable whose moments are $m_r = (r+1)!\,2^r$.

OR

4. a) What are the methods of defining a conditional event? Explain. [3M]

b) Show that a linear transformation of a Gaussian Random Variable produces another Gaussian Random Variable. [7M]

5. a) Let X and Y be defined by $X = \cos \Theta$, $Y = \sin \Theta$; where Θ is a random variable uniformly distributed over $(0,2\pi)$ i. Show that X and Y are uncorrelated ii. Show that X and Y are independent

b) Let (X, Y) be a continuous bivariate r.v. with joint pdf $f(x,y) = e^{-(x+y)}$ for x>o,y>o and equal to zero otherwise. Find the joint moments $m_{0,1}$, $m_{1,0}$, and $m_{1,1}$

OR

6. Prove that density function of the sum of the two statistically independent random variables is the convolution of their individual density functions.

7. a. State Auto correlation function and prove any three properties. (4M)

b. $Y(t) = X(t) \cos(\omega t + \Theta)$, Where X(t) is a random process and Θ is uniformly distributed over the interval $(0, 2\pi)$. Determine autocorrelation function of Y(t) and state under what conditions Y(t) WSS? Assume Θ and X(t) are statistically independent and ω is constant. (6M)

OR

8. a) Explain the significance of auto correlation.

b) Find auto correlation function of a random process whose power spectral density is given by $4/(1+(\omega 2/4))$.

9. a) State Cross Power Spectral Density and prove any two properties. (4M)

b) Let X(t) and Y(t) be defined by (6M)

$X(t) = U \cos \omega_0 t + V \sin \omega_0 t$

$Y(t) = V\cos \omega_0 t - U \sin \omega_0 t$ where ω_0 is constant and U and V are independent random variables both having zero mean and variance σ^2.

i) Find the cross-correlation function of X(t) and Y(t).

ii) Find the cross power spectral density of X(t) and Y(t).

OR

10. a) Briefly explain the concept of cross power density spectrum.

b) Find the cross correlation of functions $\sin \omega t$ and $\cos \omega t$.

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Signals and Systems**

Branch: ECE

Time: 3 hours   Max. Marks: 75

PART – A

I. Answer **ALL** questions of the following   5x1Mark=5 Marks

1. What are the major classifications of the signal?
2. Define continuous time system?
3. Define stable system?
4. Define Cross Correlation?
5. Define Z transform?

II. Answer **ALL** questions of the following   10x2Marks=20 Marks

1. State Time Shifting property in relation to Fourier series?
2. Write down the trigonometric form of the Fourier series representation of a periodic signal?
3. What is Hilbert Transform?
4. State parseval's relation for continuous time fourier transform?
5. What is the condition of LTI system to be stable?
6. Give the system impulse response h(t). State the conditions for stability and causality?
7. What is the between R(T) and ESD?
8. Write any two properties of auto correlation function?
9. Find Laplace transform of ramp signal and draw its ROC?
10. What is the differentiation property in Z domain?

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks

1. a) Find trigonometric Fourier Series for the periodic signal x(t) shown in fig below
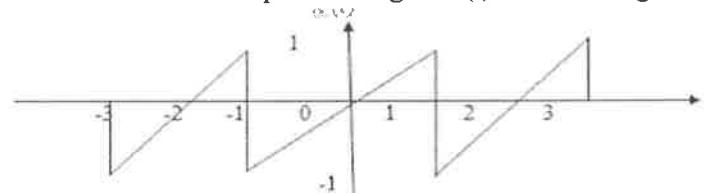
    b) Find trigonometric Fourier series for the periodic signal x(t)

    $x(t) = 0$ for $-\pi \leq t \leq$ 0

    $\qquad$ 1 for $0 \leq t \leq \pi$

(OR)

2. a) Define an energy and power signal?

    b) Determine whether the following signals are energy or power and calculate their energy and power

    $\qquad$ i) $x(n)=(1/2)n\ u(n)$

    $\qquad$ ii) $x(t)=rect(t/To)$

    $\qquad$ iii) $x(t)=cos2\ (\Omega t)$

3. a) Find the Fourier transform for the signal
   (i) $x(t) = 2\delta(t - t_0)$ (ii) $x(t) = 2\sin\Omega_0 t$
   b) Find the Fourier transform of Triangular Pulse?

(OR)

4. a) Discuss in detail about natural and flat top sampling?
   b) State and Prove convolution theorem and multiplication theorem of Fourier transform?
5. a) How do you say that an ideal LPF is physically realizable?
   b) Identify whether the systems are Time invariant or not
   i) $y_1(t) = tx(t)$ ii) $y_2(t) = x(-2t)$ iii) $y_3(t) = t\,x(t-2)$ iv) $y_4(t) = \sqrt{t}\,x(t)$

(OR)

6. a) Find the input $x(t)$ for the system having output $y(t) = e^{-2t}u(t) - e^{-4t}u(t)$ and frequency response $H(w) = \dfrac{1}{4+jw}$

   b) Stable LTI system is characterised by the differential equation

   $$\frac{d^2 y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt} + 2x(t)$$

   Find its response for input $x(t) = e^{-t}u(t)$
7. a) Using Graphical Method, Find the convolution of $x(t) = u(t+2)$, $h(t) = u(t-3)$?
   b) Find the convolution graphically between $x1(t) = rect(t/10)$ and $x2(t) = rect(t/20)$?

(OR)

8. a) Find the convolution between $x1(t) = e^{-3t}u(t)$, $x_2(t) = e^{-2t}u(t)$?
   b) State and prove the properties of auto correlation of Power Signals?
9. a) Long division method, determine the inverse Z-transform of $X(Z) = 1/(2 - 4Z^{-1} + 2Z^{-2})$ when
   (i) ROC; $|Z| > 1$ (ii) ROC; $|Z|, 1/2$?
   b) Find Laplace Transform and its ROC of the signal $x(t) = e^{-at}u(t) - e^{-bt}u(-t)$?

(OR)

10. a) State & prove initial and final value theorem of L.T?
    b) Find the Laplace transform of $x(t) = e^{-5t}u(t-1)$ and specify its ROC?

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019
Subject: **Switching Theory and Logic Design**
Branch: **ECE**

Time: **3 hours**   Max. Marks: **75**

PART – A

I.   Answer **ALL** questions of the following   **5x1Mark=5 Marks**
1. Convert octal number 764 to Binary
2. Explain meaning of Implicant and Prime Implicant.
3. Write the characteristic equation for D Flip-Flop.
4. How many flip-flops are required to design a Mod-12 counter?
5. What is a merger graph?

II.   Answer **ALL** questions of the following   **10x2Marks=20 Marks**
1. Is Excess-3 code is an example of self complementary code? Explain.
2. State the Duality Theorem.
3. Locate the minters in a three variable map for $f=\sum m(0,1,5,7)$
4. Realize Full adder using two half adders and logic gates.
5. Draw the excitation table for T Flip-Flop.
6. What is a race around condition? How it is avoided?
7. Explain briefly how the state diagrams are useful in the design of the logic circuits.
8. Define synchronous counters.
9. Mention the limitations of FSM.
10. Give the salient features of ASM chart

PART-B

Answer **ALL** questions of the following   **5x10 Marks= 50Marks**
1. a) Convert the number $(19.125)_{16}$ to base 10, base 4, base 5 and base 2.
   b) Perform the binary arithmetic operations on (-17)-(-6) using signed 2's complement representation.
   **OR**
2. a) Given $(64)_{10}=(100)b$. Determine b value   **[4]**
   b) Perform binary arithmetic operations on (+12)-(4) using signed 2's complement representation **[6]**
3. Minimize the following using tabular method. $f(w,x,y,z) = Em(1,4,8,9,13,14,15) + Eq(2,3,11,12)$
   OR
4. a) Implement the Boolean function with 8:1 multiplexersF(A,B,C,D) = sigmam (0,5,8,9,10,12,14)
   b) Explain briefly Multiplexers and Demultiplexers.
5. a) Implement edge triggered D flip flop with SR latch explain with truth table?
   b) Convert D flip flop in to JK flip flop?
   OR
6. a) Classify the required circuits into synchronous, asynchronous, clock mode, pulse mode with suitable examples.   b) Prepare the truth table for the following circuit&show that it acts as a T-flip flop.
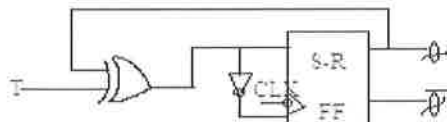
7. a) Design 4 bit serial in serial out shift register using D flip flops ?
   b) Design mode 4 bit ring counter using JK flip Flops?
   OR
8. a) Design a 3-bit binary UP/DOWN counter with a direction control M.. use J-K flip flop
   b) Draw and explain the operation of the 4-bit parallel-in-parallel-out shift register.
9. a) Explain in detail the block diagram of ASM chart.
   b) Draw an ASM chart to convert D-flip flop to T-flip flop.
   OR
10. a) What is serial binary adder? Explain its working with the help of a state diagram.
    b) Write about implementation of binary multiplier

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Principles of Electrical Engineering**

Branch: **ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I.   Answer **ALL** questions of the following   5x1Mark=5 Marks
1. Define Time constant?
2. Write the reciprocity conditions in ABCD parameters.
3. Define pass-band in filter circuits.
4. What is core loss in a dc motor?
5. Write the purpose of transformers?

II.   Answer **ALL** questions of the following   10x2Marks=20 Marks
1. Draw the current response of series RC circuit.
2. Explain why the capacitor does not allow sudden change in voltage.
3. Draw the Equivalent circuit diagram of h-parameters?
4. Determine ABCD parameters for the given Z-Parameter Z11=4 Ω, Z12=2Ω, Z21=1 Ω, Z22=2Ω.
5. What are the various types of filters
6. Draw the circuit diagram of m-derived T-section filter?
7. Enumerate various losses in a dc motor?
8. Mention the speed control methods of DC Motor?
9. What are the various losses in transformer
10. Explain about Hystresis loss in the transformer?

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks
1. With the assumption that the switch in the circuit of Fig. has been closed a long, long, long time, calculate $i_L(t)$ at (a) the instant just before the switch opens; (b) the instant just after the switch opens; (c) t = 15.8 μs; (d) t = 31.5 μs; (e) t = 78.8 μs.
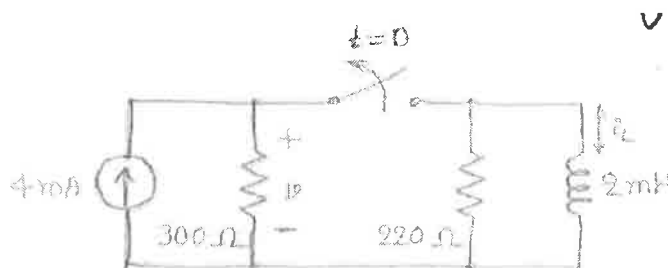
OR

2. a)For the circuit shown in figure, find the current equation i(t), when the switch's' is opened at t=0.
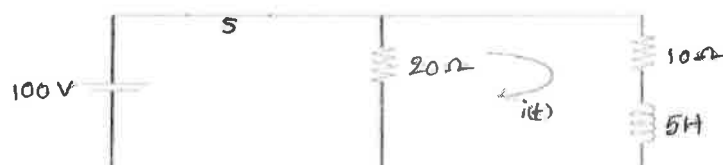
b) Obtain the response of series RC circuit with DC excitation?

3. a) Derive the relationship between admittance parameters and h-parameters?

   b) Explain the interconnection of two networks in cascade with an example?

OR

4. a) What is Z-parameters and explain the basic terms? **(4)**

   b) Find the impedance parameters for the following T-network? **(6)**
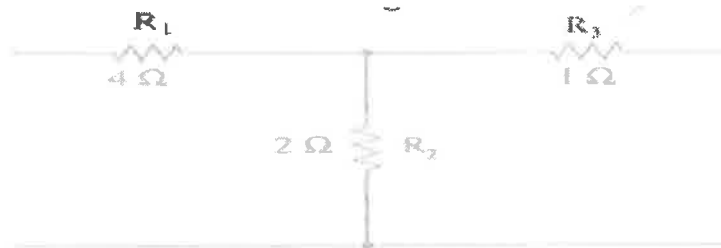
5. Explain T-type attenuator in detail and also design a T-type attenuator to give an attenuation of 60dB and to work in a line of 500Ω impedance.

OR

6. a) Draw and explain symmetrical lattice Attenuator.

   b) Design a $\prod$-type attenuator to give 20db attenuation & to have characteristic impedance of 100Ω.

7. A 10kW, 250 V, 8-pole, 600r.p.m lap-connected d.c. generator has 400armature conductors. At rated voltage & current, armature ohmic losses are 150 watts. Compute the useful flux per pole?

OR

8. Explain about types of generator with neat diagram?
9. Explain the constructional details of a single phase transformer

OR

10. a) Explain the procedure to conduct O.C and S.C tests & find regulation of a transformer? **(6)**

    b) Write a short note on Synchros. **(4)**

3

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Electrical Circuits**

Branch: **Common to EEE & ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I.   Answer **ALL** questions of the following   5x1Mark=5 Marks

1. Define Peak factor and Form factor?
2. Define Kirchhoff's Laws?
3. Define self-inductance.
4. What is a Planar Graph?
5. State Maximum power transfer theorem.

II.   Answer **ALL** questions of the following   10x2Marks=20 Marks

1. Define active and passive elements?
2. If three resistances R1, R2 and R3 are connected in wye. Write the equivalent resistances when connected in delta in terms of wye
3. Compare the differences between Series Resonance and Parallel Resonance?
4. A voltage $V = 12 \cos(60t+45°)$ is applied to a inductor having reactance of $j6\Omega$. find the steady state current through the inductor
5. Two identical coupled coils have an equivalent inductance of 80mH when connected series aiding and 35mH in series opposing. Find L_1, L_2, M and K?
6. Two coils connected in series have an inductance of 0.1H and 0.3H respectively. The coefficient of coupling between the two coils is 0.9. find the equivalent inductance when both the coils are (i) Aiding (ii) Opposing
7. What is duality? What are dual quantities?
8. If a network contains B branches, and N nodes, then the size of cutset matrix is
9. What are the limitations of Super Position theorem?
10. Find the current flowing through 10Ω resistor using superposition theorem

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks

1. Determine the voltages at each node by using nodal analysis for the circuit shown in the fig1?
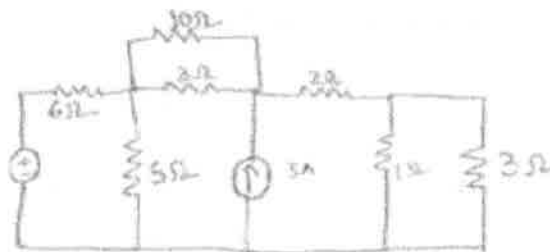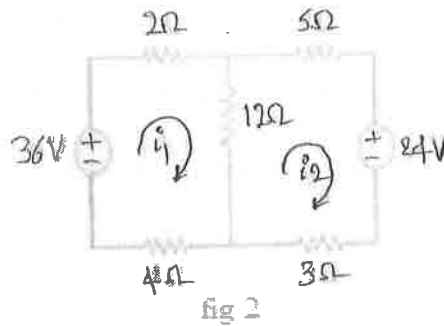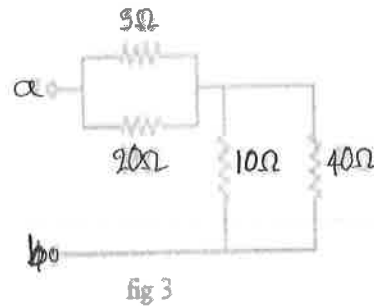

fig 1

OR

2. a) Calculate the mesh currents i_1 and i_2 of the circuit of Fig2.

fig 2

b) Calculate the equivalent resistance R_{ab} at terminals a-b for each of the circuits in Fig3.

fig 3

3. A series RLC circuit with R=100Ω, L = 0.5H, C=40μF has an applied voltage of $100<0^0$ with variable frequency. Calculate the resonance frequency, current at resonance. Also calculate the Q-factor, upper and lower cutoff frequencies and bandwidth?

OR

4. a) Construct the phasor and impedance diagram and determine the circuit constants for the following voltage and current. V(t)=150 sin(5000t+50°)V, i(t)=5 sin(5000t -25°)A   [4]
   b) Find the average value of the given waveform   [6]
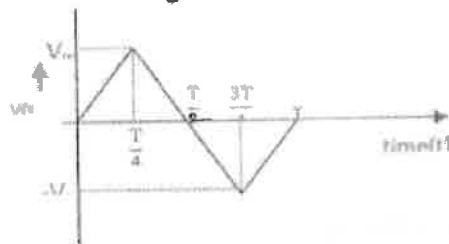
5. Derive an expression for equivalent inductance when two coils are connected in parallel Aiding?

OR

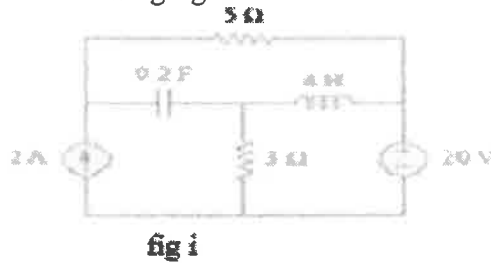6. Determine the Leg equivalent in the circuit of Figure.
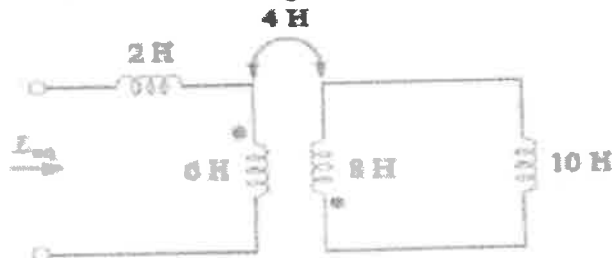
7. a) Write short notes on connected graph and tie-set.?
   b) For the following graph i., determine a cut-set matrix taking 3,4,5,8 as the twigs of the tree. a,b,c,d,e are the nodes of the graph.?
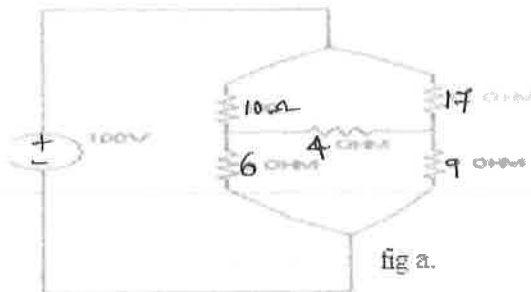

graph i
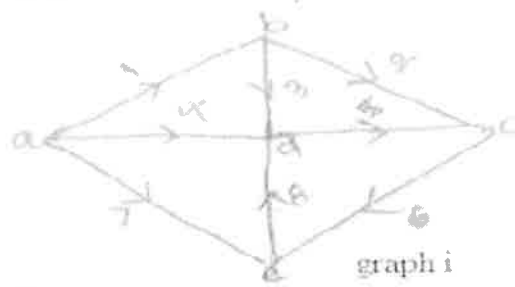
OR

8. a) Write dual elements for various electrical elements. [4]
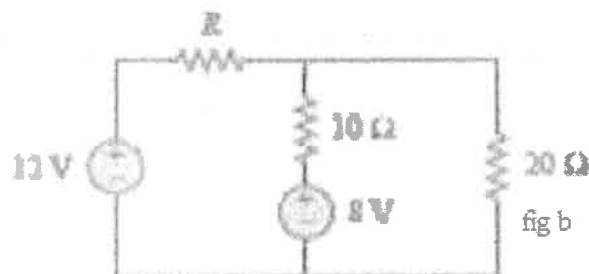   b) Draw the dual network for the following fig i. [6]

fig i

9. By Using Thevenin's theorem, find the current through the 4Ω resistor?(fig a)

fig a.

OR

10. Compute the value of R that results in maximum power transfer to the 10- resistor in Fig b. Find the maximum power.

fig b

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019

Subject: **Mathematics – IV & Mathematics - III**

Branch: **Common to EEE & ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I.   Answer **ALL** questions of the following   5x1Mark=5 Marks

1. Find the solution of differential equation $x^2 y'' + xy' = 0$
2. Express x^2+1 in terms of Legendre polynomials.
3. Define Cauchy's integral formula.
4. Define Removable singularity.
5. Find the fixed points of the transformation $w = \frac{z-1}{z+1}$

II.   Answer **ALL** questions of the following   10x2Marks=20 Marks

1. Find the singular points of $x^2 \frac{d^2y}{dx^2} + (x + x^2)\frac{dy}{dx} - y = 0$
2. Reduce the D.E. $x^2 \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2$ to linear differential equation with constant coefficients
3. Prove that $\frac{d}{dx}\left(xJ_1(x)\right) = xJ_0(x)$
4. Prove that $\int_{-1}^{1} P_0(x)dx = 2$
5. Show that $f(z) = xy + iy$ is everywhere continuous but not analytic.
6. Using Cauchy's integral theorem; evaluate $\oint_c \frac{e^{-z}}{z+1} dz$ where C is the circle $|z| = \frac{1}{2}$
7. Find the residue of the function $f(z) = \frac{z+1}{z^2(z-2)}$ at $z = 2$.
8. Evaluate $\oint_c \frac{e^z}{z^2+1}$ dz over the circular path $|z| = 2$.
9. If the rectangular region D in the z - plane be bounded by $x = 0$, $y = 0$, $x = 2$, $y = 3$, determine the region D' of the W-Plane into which D is mapped under the transformation $w = \sqrt{2}e^{i\frac{\pi}{4}} z$.
10. Find the image of the triangle with vertices at i,1+i,1-i in the z-plane under the transformation $W=3z+4-2i$

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks

1. Find the power series solution of the equation $\frac{d^2y}{dx^2} + xy = 0$ in powes of x.

OR

2. Solve in series: $(1- x^2)y'' - xy' + 4y = 0$
3. Express $x^3 + 2x^2 - x - 3$ in terms of Legendre polynomials.

OR

4. i) Prove that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} Sin\ x$ and $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} Cos\ x$ ii) Prove that $J_{\frac{3}{2}} = \sqrt{\frac{2}{\pi x}}\left\{\frac{Sinx}{x} - Cosx\right\}$
5. Evaluate $\int_c \frac{e^{2z}}{(z-1)(z-2)}$ dz where C is the circle $|z| = 3$.

OR

6. a) Find the analytic function f(z) = u+iv where $V = e^x(x\ siny + y\ cos\ y)$
    b) State and prove Cauchy's Integral Theorem.
7. Show that $\int_0^{2\pi} \frac{1}{1+a^2-2acos\theta} d\theta = \frac{2a\pi}{1-a^2}$; 0<a<1 using residue theorem.

OR

8. Evaluate $\int_0^{2\pi} \frac{d\theta}{1+asin\theta}$
9. a) Find the image of the circle $|z - 1| = 1$ under the transformation $w = z^2$
    b) Plot the image of $1 < |z| < 2$ under the Transformation $w = 2iz + 1$.

OR

10. Find and plot the image of the triangular region with vertices (0,0)(1,0)(0,1) under the transformation $w=(1-i)z+3$

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2019
Subject: **Electronic Devices and Circuits**
Branch: **Common to EEE & ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I.   Answer **ALL** questions of the following   5x1Mark=5 Marks
1.   What is Hall Effect?
2.   Define Diffusion Current.
3.   How many layers are available in SCR?
4.   Calculate β factor when α is 0.98.
5.   Define Thermal Runaway

II.   Answer **ALL** questions of the following   10x2Marks=20 Marks
1.   Prove that the path of an Electron in electric field is a parabola?
2.   What is a Fermi level?
3.   Mention some applications of PN Diode?
4.   Draw the V-I characteristics of a PN Junction diode and mark all the regions of operation.
5.   Derive the expression for ripple factor of Full wave rectifier?
6.   Give the comparison between Half Wave and Full Wave rectifiers.
7.   Draw the circuit symbols of NPN and PNP Transistor?
8.   Explain the difference between BJT & JFET?
9.   Define biasing and load line?
10. Mention the different bias compensation techniques.

PART-B

Answer **ALL** questions of the following   5x10 Marks= 50Marks
1.   a) Derive the expression of Electro Static Deflection Sensitivity.   [6M]
     b) Calculate the time taken by an electron which has been accelerated through a potential difference of 1000V, to traverse a distance of 2cm. given $q=1.6 \times 10^{-19}$ c. & $m = 9.1 \times 10^{-31}$ kg.   [4M]

                                                  OR

2.   i) Explain the function of vertical deflection system in a CRO with block diagram?
     ii) Explain about electrostatic deflection sensitivities?

3.   a) Define Static Resistance and Dynamic Resistance.
     b)Determine forward Resistance of PN junction diode when forward current is 5mA at T=300°K.Assume silicon diode.

                                                  OR

4.   a) Derive the expression for Transition Capacitance C_T of a diode.   [6M]
     b)Explain the process of breakdown of a P-N junction diode due to (i)Avalanche effect (ii)Zener effect. [4M]

5.   Describe the following briefly i) Principle of operation of a photodiode?   [4M]
     ii) Energy band structure and V-I characteristics of a tunnel diode?   [6M]

                                                  OR

6.   Derive the expressions for Ripple factor, Regulation& Rectifier Efficiency for Half wave Rectifier?

7.   a) Explain different current components in a Transistor with diagrams.
     b) Draw the input and output characteristics of BJT in Common collector configuration.

                                                  OR

8.   a) Draw the Circuit and explain the drain and transfer characteristics of a JFET in common source configuration.   [6M]
     b) Why we call NET as a Voltage Controlled Device.   [4M]

9.   a) Derive the expression for Stability Factor 'S'.
     b) Draw a Fixed bias circuit and derive the expression for Stability Factor.

                                                  OR

10. Explain the self-biasing in FET and derive necessary equations.