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, NOVEMBER-2019

Subject: ELECTRONIC DEVICES & CIRCUITS

Branch: Common to EEE,&ECE

Time: 3 hours   Max. Marks: 75

PART – A

I. Answer ALL questions of the following   **5x1M=5 M**

1. Define carrier life time.

2. Explain the term 'dynamic resistance'?

3. Define form factor?

4. Write the Diode Current Equation and mention the name of each component in it.

5. Define stability.

II. Answer ALL questions of the following   **10x2M=20 M**

1. What are the essential components of a CRT?

2. In a CRT the distance of the screen from the centre of the magnetic field 20cm. The deflecting magnetic field of flux density $1*10^{-4}$ Wb/m^2 extends for a length of 2cm along the tube axis. The final anode voltage is 800v. Calculate the deflection of the spot?

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. Write advantages and disadvantages of Tunnel diode?

6. How the current is reduced to zero in a photodiode?

7. Draw the circuit symbols of NPN and PNP Transistor?

8. Explain the difference between BJT & JFET?

9. Explain the concept of DC load line and AC load line in BJT.

10. Draw the collector to base bias circuit of transistor.

PART-B

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

1. At the moment t = 0 an electron leaves one plate of a parallel-plate capacitor with a negligible velocity. An accelerating voltage, varying as V = at, where a = 100 V/s, is applied between the plates. The separation between the plates is l = 5.0 cm. What is the velocity of the electron at the moment it reaches the opposite plate?   [10M]

OR

2. a)The deflecting plates of cathode ray tube are 2.5cm along and apart. The distance from the centre of the plates to the screen is 30cm. The final anode voltage is 1.5KV. Calculate

    (i)Deflection sensitivity   (ii)The velocity with which the electron leave the final anode.

   b)Derive the expression for hall coefficient.

3. (i)With the help of necessary sketches explain the potential distribution in an open circuited PN junction? (ii)Determine the value of forward current in the case of a p-n junction diode, with $I_0=10\mu A$. $V_F =0.8V$ at $T=300°K$. Assume silicon diode. [5+5M]

OR

4. Explain the switching characteristics of diode with the help of simple diode circuit. [10M]

5. Draw the circuit of Full Wave Rectifier and find out the Ripple factor,% of regulation, efficiency and PIV. [10M]

OR

6. Derive the expressions for Ripple factor, Regulation and Rectifier Efficiency for Half wave Rectifier? [10M]

7. With neat sketches explain the operation of Depletion type MOSFET. [10M]

OR

8. With a neat sketch explain the drain source characteristic and transfer characteristics of enhancement type MOSFET?. [10M]

9. Explain the operation of following Biasing Techniques. i) Fixed bias ii) Self bias [5+5M]

OR

10. What are requirements of FET biasing? Verify these requirements in source self-bias circuit? [10M]

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019
Subject: **MATHEMATICS-III & MATHEMATICS-IV**
Branch: **EEE & ECE**

Time: 3 hours   Max. Marks: 75

PART – A

I. Answer ALL questions of the following   5x1M=5 M

1. In which case Frobenius method is preferred.
2. Express $J_2(x)$ in terms of J_0 and J_1.
3. Define Analytic function.
4. Define essential singular point.
5. Find the points at which $w = \cosh z$ is not conformal.

II. Answer ALL questions of the following   10x2M=20 M

1. Transform $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = \frac{1}{x}$ into a linear differential equations with constant coefficients.
2. Solve $(x^2D^2 - 4xD + 6)y = x^2$.
3. Prove that $P'_n(1) = \frac{n(n+1)}{2}$.
4. Prove that $\frac{d}{dx}(J_0(x)) = -J_1(x)$.
5. Show that $u = \frac{x}{x^2+y^2}$ is harmonic.
6. Discuss the continuty of $f(x, y) = \begin{array}{l} \frac{2x \ (x+y)}{x^2+y^2}, if\ (x,y) \neq (0,0) \\ 0, if\ (x,y) = (0,0) \end{array}$
7. Find the residue for $f(z) = \frac{z}{z^2-1}$.
8. Find the residue of $f(z) = \frac{z^2}{z^2+a^2}$ at $z = ai$.
9. Write the cross ratio property of four points.
10. Find the fixed points of the mapping $W = \frac{2z-5}{z+4}$.

PART-B

Answer ALL questions of the following   5x10 M= 50M

1. Solve in series $xy'' + 2y' + xy = 0$ by using Frobenious method.
<div align="center">OR</div>
2. Solve $(1+x)^2\frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = 4\cos\log(1 + x)$ by reducing it to linear differential equation with constant coefficient.

3. Prove that $J_0(x) = 1 - \frac{x^2}{2^2} + \frac{x^4}{2^2 4^2} - \frac{x^6}{2^2 4^2 6^2} + \dots \dots \dots$

OR

4. Prove that $\int_{-1}^{1} p_m(x) p_n(x) dx = \begin{cases} 0, if\ m \neq n \\ \frac{2}{2n+1}, if\ m = n \end{cases}$

5. Find an analytic function whose real part is $\frac{sin}{cosh 2y - cos 2x}$

OR

6. Prove that the function f(z) defined by $f(z) = \begin{cases} \frac{x^3(1+i) - y^3(1-i)}{x^2 + y^2}, if\ z \neq 0 \\ 0, if\ z = 0 \end{cases}$ is continuous and the C-R equations are satisfied at the origin, yet f'(0) does not exist.

7. Using the method of contour integration, Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$.

OR

8. a) Expand $f(z) = \frac{1+2z}{z^2+z^3}$ in a series of positive and negative powers of Z.

   b) Evaluate $\int_c \frac{ze^z}{z(z-3)} dz$ where c is $|z|=2$ by residue theorem.

9. Find the bilinear transformation which maps the points z = 1, i, -1 onto the points w = i, 0, -i. Hence find the image of $|z| < 1$.

OR

10. Show that the function $W = \frac{4}{z}$ transforms the straight line x = c in the z-plane into a circle in the W-plane.

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

Subject: ELECTRICAL CIRCUITS

Branch: COMMON TO EEE & ECE

Time: 3 hours   Max. Marks: 75

PART – A

I. Answer ALL questions of the following   5x1M=5 M

1. What is ideal independent source?
2. What is condition for resonance in a series RLC circuit?
3. Define self-inductance.
4. What is cutset?
5. Define the statement of compensation theorem (DC).

II. Answer ALL questions of the following   10x2M=20 M

1. Find the voltages V_1 and V_2.
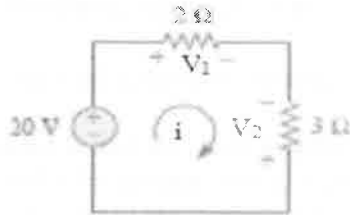
2. Write short notes on super node and super mesh.
3. If $V_1 = -10 \sin(\omega t - 30°)$ V and $V_2 = 20 \cos(\omega t + 45°)$ V. find $V_1 + V_2$.
4. Find the resonant frequency and bandwidth for a series RLC circuit having R=1k , L = 100mH and C = 0.1μf.
5. Compare the analogy of magnetic circuits and electric circuits.
6. State and explain the laws of Magnetism.
7. Define i) Node ii) Loop and explain them by taking an example.
8. Write the formulae to calculate the number of links for a given graph with ' b' branches and 'n' nodes.
9. Illustrate the statement of Milliman's theorem (DC).
10. State Thevenin's theorem.

PART-B

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

1. Find the value of current for the network shown in the figure by using Star- delta / delta- star transformation?
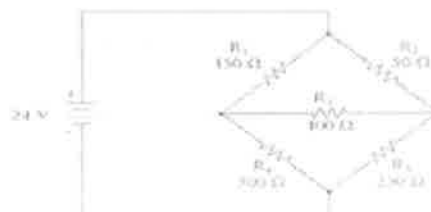
OR

2. In the circuit shown in Figure, determine v., and the power absorbed by the 120 resistor.

3. For the parallel circuit shown in the figure, solve the current in each branch and total current. What is the phase angle between the applied voltage and total current?
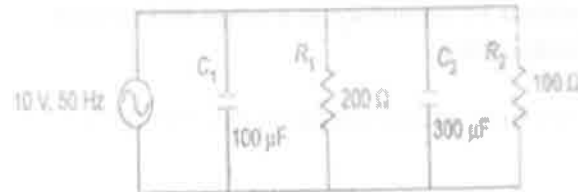

OR

4. a) Show that in a series RLC circuit, $f_0 = \sqrt{f_1 f_2}$ where fo is the resonant frequency and f1, f2 are half power frequencies.
b) Derive the Expression for i(t) for R-L series circuit when Excited by a sinusoidal source.

5. An iron ring of 20cm in diameter and 15cm^2 in area of cross section is wound with coil of 400 turns. Determine the current in the coil to establish a flux density of 1.5wb/m^2. If the relative permeability of iron is 800. In case if an air gap of 2.5mm is cut in the ring, what is the current in the coil to establish the same flux density? Neglect leakage flux.

OR

6. a) Explain Dot convention with neat circuit diagram. [4]
b) Two similar coils connected in series give a total inductance of 600 mH and when one of the coils is reverse, the total inductance is 300 mH. Determine mutual inductance and coefficient of coupling. [6]

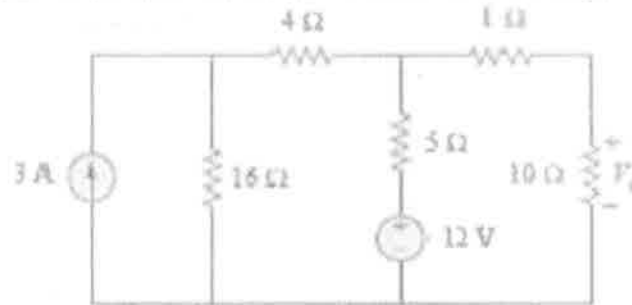7. Draw a graph of the network shown in figure. Write cut set matrix.
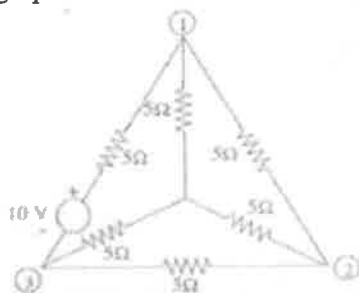
OR

8. a) Explain when two circuits are said to be dual. Write dual elements for various electrical elements.
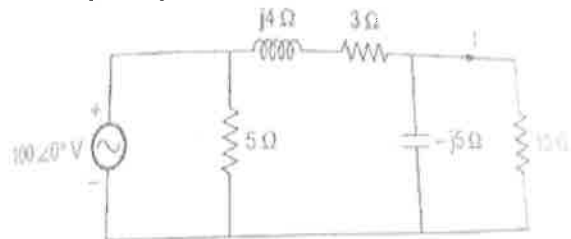b) Draw the dual network for the following figure. [4+6M]
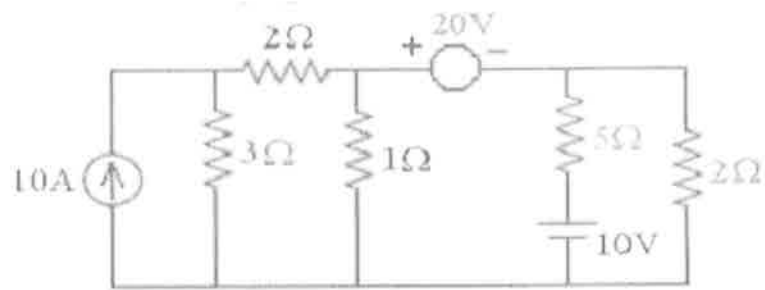
9. Apply Thevenin's theorem to find V_o in the circuit of Fig.

OR

10. Verify the reciprocity theorem for the network shown in fig.

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

Subject: **ELECTRO MAGNETIC FIELDS**

Branch: **EEE**

Time: 3 hours   Max. Marks: 75

PART – A

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

1. A Scalar function, V is given by $V=xyz^2$. Find the gradient of V.

2. State the conditions under which a physical dipole tends to become a point dipole.

3. Write any two characteristics of permanent magnets.

4. Define Magnetic force.

5. Define mutual inductance.

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

1. A total charge of a 8 nC over a surface area of $0.1m^2$.find the surface charge density.

2. Define Stokes theorem.

3. Define Capacitance. Derive the equation of energy stored in a capacitor.

4. Find the capacitance of an isolated conductor of radius 1 cm.

5. Define "Magnetic Field Intensity".

6. Divergence of $\bar{B}$ is zero. Justify.

7. Prove that the force on a closed filamentary circuit in a uniform magnetic field is zero.

8. What are the limitations of a "Scalar Magnetic Potential"?

9. Two coupled coils with L1=20mH, L2=10mH and K=0.5 are connected in series opposing, Find their equivalent inductance.

10. What is "Poynting Vector"?

PART-B

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

1. a) Transform the vector B= ya_x- xa_y +za_z, into cylindrical and spherical coordinates.   [6M]

   b) Describe the three coordinate systems with suitable diagrams.   [4M]

OR

2. a) State and prove divergence theorem

   b) Determine laplacian of scalar field A=x^2y+xyz.

3. a) Write a note on Torque on an electric dipole in an electric field. [4M]

   b) Show that the potential due to a dipole is given by [6M]

$$V = \frac{Qd \cos\theta}{4\pi\varepsilon_0 r^2}$$

OR

4. a) Derive an expression for energy stored in the electrostatic field in terms of E and D?

   b) Obtain the expressions for the electric field and the potential due to a small electric Dipole oriented along z-axis.

5. State Biot-Savart's law and deduce an expression for $\vec{H}$ at a point located at a distance of r metres from an infinitely long straight conductor carrying I amperes.

OR

6. Explain the nature of line, surface and volume current distributions as applicable to static magnetic fields list out the expressions for the magnetic field intensity in these three cases

7. a) Explain scalar magnetic potential and mention its characteristics.

   b) The magnetic field in a current free region is given by H= (1/ρ) a_ϕ+. The region is defined by $1 \le \rho \le 2m, 0 \le \phi \le 2\Pi$ and $0 \le z \le 2m$. Find the scalar magnetic potential at (4, 50°, 2).

OR

8. a) Write Maxwell's equations for static Electromagnetic fields in both differential & integral form & explain.

   b) Find the magnetic field about a long straight wire with current flow 'F' by means of the vector potential.

9. a) Write and explain Maxwell's fourth equation. [4M]

   b) Derive of the expression for magnetic field and magnetic flux density of a solenoid. [6M]

OR

10. a) What is the inconsistency in Amperes law? How it is rectified by Maxwell?

    b) A parallel plate capacitor with plate area of $5cm^2$ and plate separation of 3mm has a voltage 50sin103t V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$.

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019
Subject: **ELECTRICAL MACHINES-I**
Branch: **EEE**

Time: 3 hours   Max. Marks: 75

PART – A

I. Answer ALL questions of the following   **5x1M=5 M**

1. State the co energy of a energy conversion device

2. Distinguish between internal and external characteristics of a dc generator?

3. What are the factors that affect the choice of number of poles?

4. Which method we must adopt to control the speed of a dc shunt motor below the base speed?

5. What are the possible causes of sparking at brushes?

II. Answer ALL questions of the following   **10x2M=20 M**

1. Write any two applications of singly excited electromechanical energy conversion devices

2. Write the expression of energy density in magnetic field and in electric field?

3. Write any two characteristics of simplex Wave winding.

4. Write the methods which are used for improving commutation?

5. Is equalizer bar needed for parallel operation of under compounded generators? Justify

6. What is ment by OCC of a DC generator?

7. Draw the speed torque characteristic of a dc series motor.

8. Discuss Characteristics and applications of shunt motor?

9. Mention the disadvantage of Hopkinson's test

10. Why Hopkinson's test is called regenerative test?

PART-B

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

1. a) Explain about Multi excited system

    b) Derive the Magnetic force in doubly excited field system   [7M] [3M]

                                OR

2. For a doubly excited magnetic field system, various inductances are $L_{11} = (4+\cos2\Theta)$ mH, $L_{22} = (20+5\cos2\Theta)$ H & $L_{12} = 0.15\cos\Theta$ H. Find the torque developed if $i_1= 1.0$ A and $i_2= 0.02$ A. Also explain the significance of each term in torque?

3. Describe the constructional details of a DC Generator with neat sketches?

                                OR

4. a) Explain clearly the function of the following in dc machines (i) Compensating windings (ii) interpoles   [4M]

b) An 8 pole DC generator running at 1200rpm and with a flux of 25m wb per pole generates 440V. Calculate the number of conductors, if the armature is 1) lap wound 2) wave wound [6M]

5. Sketch and explain the complete load characteristics of a dc series generator and indicate there in the region of operation of the machine as a voltage booster and as a current source.

OR

6. a) What are the reasons for the parallel operation of DC generator?

b) What are the conditions necessary for parallel operation of DC shunt generator?

7. A 250V, 4 pole shunt has two circuit armature winding with 500 conductors. The armature circuit resistance is 0.25 ohms field resistance is 125 ohms and the flux per pole is 0.02 Wb neglect armature reaction. Find the speed and torque developed if the motor draws 14A from the mains.

OR

8. a) What is the significance of back e.m.f in a DC motor? [4M]

b) A 12-pole lap connected 230V shunt motor has 410 conductors. It takes 41A on full-load. The flux per pole is 0.05 Wb. The armature and field resistances are 0.1 ohm and 230 ohms respectively. Contact drop per brush is 1V. Determine the speed of motor at full-load. [6M]

9. a) Write short notes on field test for dc series machines.

b) Describe all types of losses in a shunt and compound wound generator. State which comprise constant loss.

OR

10. Explain the Swinburne's test to determine no-load losses of DC machine. What is the limitation of this test?