

**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-2018**Subject: Electrical Circuits

Branch: Common to EEE &amp; ECE

Time: 3 hours

Max. Marks: 75

**PART – A****I. Answer ALL questions of the following**

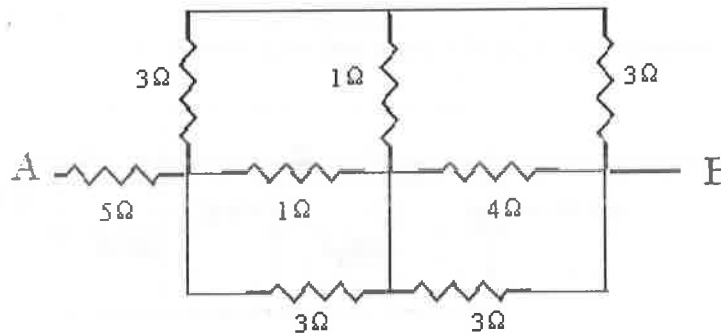
5x1Mark=5 Marks

1. Define Kirchoff's Laws?
2. Define Peak factor and Form factor?
3. Explain Faraday's laws of electromagnetic induction?
4. Define tree?
5. Define the statement of compensation theorem (DC)?

**II. Answer ALL questions of the following**

10x2Mark=20 Marks

1. Find the equivalent resistance between the terminals A & B for the network shown in the figure?



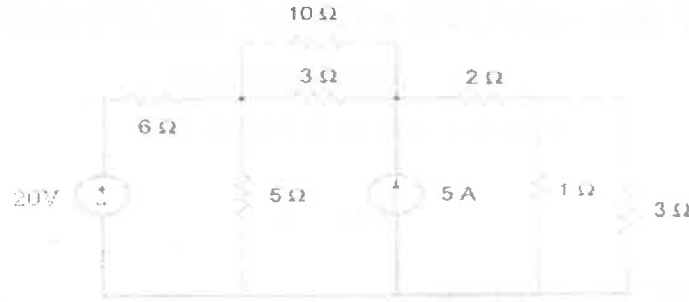
2. Define active and passive elements?
3. Compare the differences between Series Resonance and Parallel Resonance?
4. Define Resonance and Q-factor?
5. Compare the analogy of magnetic circuits and electric circuits?
6. Two identical coupled coils have an equivalent inductance of 80mH when connected series aiding and 35mH in series opposing. Find  $L_1$ ,  $L_2$ ,  $M$  and  $K$ ?
7. Define i) Node ii) Loop and explain them by taking an example?
8. What is duality? What are dual quantities?
9. Illustrate the statement of Milliman's theorem (DC)?
10. What are the limitations of Super Position theorem?

PART-B

Answer ALL questions of the following

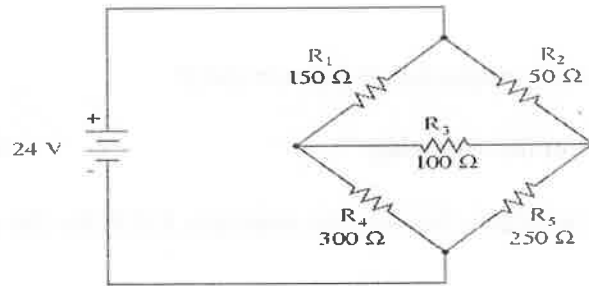
5x10 Marks= 50Marks

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

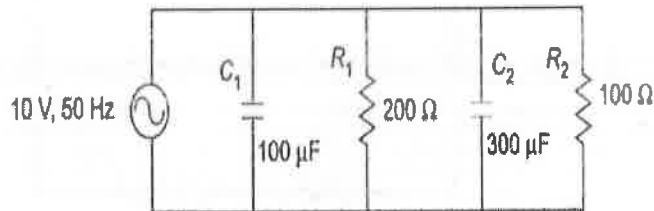


(OR)

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



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 series RLC circuit with  $R=100\Omega$ ,  $L = 0.5H$ ,  $C=40\mu F$  has an applied voltage of  $100\angle 0^\circ$  with variable frequency. Calculate the resonance frequency, current at resonance. Also calculate the Q-factor, upper and lower cutoff frequencies and bandwidth?

5. Derive an expression for equivalent inductance when two coils are connected in parallel Aiding?

(OR)

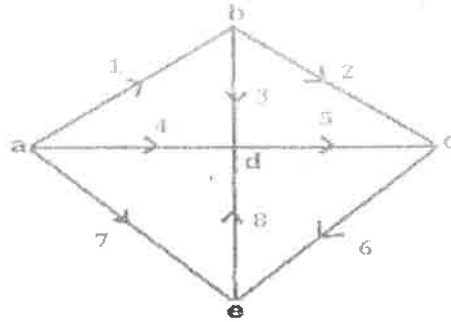
6. An iron ring of 20cm in diameter and  $15cm^2$  in area of cross section is wound with coil of 400 turns. Determine the current in the coil to establish a flux density of  $1.5wb/m^2$ . If the relative permeability of iron is 800. In case if an air gap of 2.5mm is cut in the ring, what is the current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

7. Describe the procedure to construct the dual of a network with an example.?

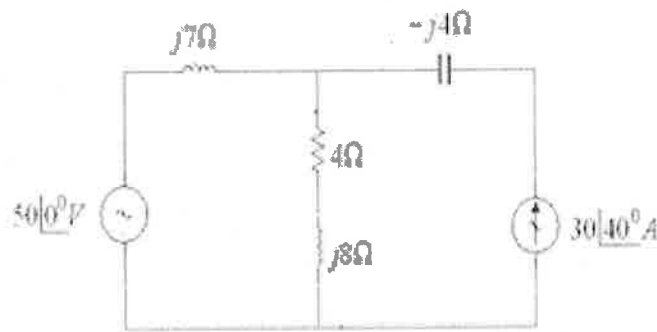
(OR)

8. a) Write short notes on connected graph and tie-set.?

b) For the following graph 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.?

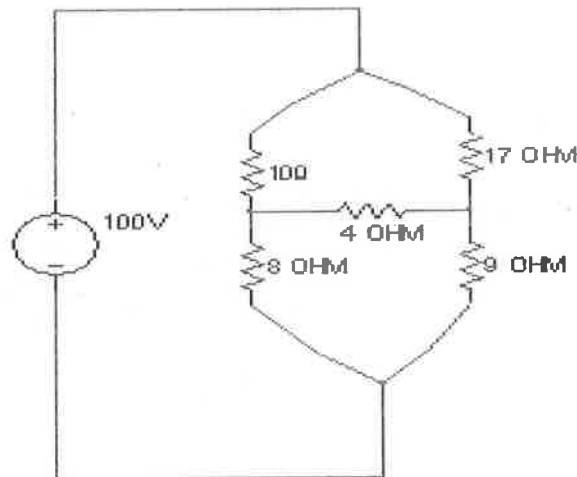


9. Determine voltage across  $4+j8\Omega$  as shown in the figure by using Super Position theorem.?



(OR)

Q10 By Using Thevenin's theorem, find the current through the  $4\Omega$  resistor?





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1. Explain about co-energy?
2. Distinguish between internal and external characteristics of a dc generator?
3. Explain the action of coupling medium in case of generator?
4. What are the factors that affect the choice of number of poles?
5. What is the condition for maximum power developed in dc motors and what is the efficiency of the motor at that condition?

**II. Answer ALL questions of the following****10x2Mark=20 Marks**

1. What is electromagnetic conversion?
2. What is different between force and torque in magnetic field?
3. Mention the difference between lap and wave winding.
4. What are the requirements of voltage build up in self excited D.C generator.
5. Explain the function of commutator in DC generators?
6. What are the characteristics of dc shunt generator?
7. Discuss Characteristics and applications of shunt motor?
8. Discuss different parts in dc motors?
9. Steps to conduct a break test in dc shunt motor?
10. Brief note on Losses in Dc Motors

**PART-B****Answer ALL questions of the following****5x10 Marks= 50Marks****Q1.** Explain briefly an electromechanical energy conversion device with the help of a block diagram.**(OR)****Q2.** Derive an expression for co-energy density of an electromechanical energy conversion device.**Q3.** Explain the principle of operation of a d.c. generator and derive its emf equation**(OR)****4.** What is meant by armature reaction? Explain the effect of armature mmf on the main filed flux can be described with the help of magnetization curve of a d c machine?**Q5.** 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)****6.** Distinguish between external and internal characteristics of a d.c. generator. Explain, with appropriate diagrams, how the internal characteristics can be obtained from the external characteristics of the series and shunt generators?**7.** Explain briefly different methods for speed control of dc motors.**(OR)****8.** Write short notes on ward-Leonard method of speed control.**9.** What are the various losses occurring in rotating machines. Mention the methods to reduce them**(OR)****10** Explain the Swinburne's test to determine no-load losses of DC machine. What is the limitation of this test?



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Time: 3 hours

Max. Marks: 75

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

1. What is Hall Effect?
2. What is the cut in voltage for Silicon diode?
3. How many layers are available in SCR?
4. Define Emitter efficiency?
5. Define Self-biasing?

**II. Answer ALL questions of the following****10x2Mark=20 Marks**

1. Write the applications of CRO?
2. Prove that the path of an Electron in electric field is a parabola?
3. What is mean by Barrier Potential?
4. Mention some applications of PN Diode?
5. Derive the expression for ripple factor of Full wave rectifier?
6. Write advantages and disadvantages of Tunnel diode?
7. What are different features of FFT?
8. Draw the circuit symbols of NPN and PNP Transistor?
9. Derive the relation between  $\alpha$  and  $\beta$ ?
10. Define biasing and load line?

**PART-B****Answer ALL questions of the following****5x10 Marks= 50Marks****Q1.** Explain the operation of C.R.O with neat diagram? (10M)**(OR)****Q2.** i) Derive the expressions for acceleration, velocity of a charged particle placed in an electric field E?

ii) Derive the expression for continuity equation? [5+5]

**Q3.** (a) Define Static Resistance and Dynamic Resistance.

(b) Determine forward Resistance of PN junction diode when forward current is 5mA at

 $T=300^{\circ}\text{K}$ . Assume silicon diode. [5+5]**(OR)****Q4.** (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  $I_0=10\mu\text{A}$ .  $V_F=0.8\text{V}$  at  $T=300^{\circ}\text{K}$ . Assume silicon diode. [5+5]

**Q5.** Draw the circuit of Full Wave Rectifier and find out the Ripple factor,% of regulation, efficiency and PIV. (10)

(OR)

**Q6.** Describe the following briefly

- i) Principle of operation of a photodiode?
- ii) Energy band structure and V-I characteristics of a tunnel diode? [4+6]

**Q7. (a)** Explain different current components in a Transistor with diagrams. (5+5)

**(b)** Draw the input and output characteristics of BJT in Common collector configuration.

(OR)

**Q8.** With neat sketches explain the operation of Depletion type MOSFET. (10)

**Q9. (a)** Derive the expression for Stability Factor 'S'.

**(b)** Draw a Fixed bias circuit and derive the expression for Stability Factor. (5+5)

(OR)

**Q10 .** Explain the operation of following Biasing Techniques. (5+5)

- i) Fixed bias
- ii) Self bias



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Branch: EEE

Time: 3 hours

Max. Marks: 75

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

1. State Stoke's theorem.
2. What is Electric Dipole?
3. Write the relation between magnetic flux, flux density and MFI.
4. Write Lorentz force equation.
5. State pointing theorem.

**II. Answer ALL questions of the following****10x2Mark=20 Marks**

1. Transform a vector  $A = YI_x - XI_y + ZI_z$  in to cylindrical co-ordinates.
2. Explain the properties of potential function.
3. Write the expression for capacitance of co-axial cable.
4. Write Ohm's law in point form.
5. Write the expression for magnetic field intensity in infinite long wire carrying a current I.
6. Write the point form of Ampere's circuital law.
7. Describe the magnetic dipole moment.
8. Define scalar magnetic potential. Write its applications.
9. Define self-inductance and mutual inductance.
10. Find the poynting vector on the surface of a long straight conducting wire (or radius 'b' and conductivity ' $\sigma$ ') that carries a direct current I.

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

- Q1.** (a) State and prove gauss law. Give the applications of gauss law.  
(b) What are the major sources of electromagnetic fields?

**(OR)**

- Q2.** Check validity of the divergence theorem considering the field  $D = 2xy a_x + x^2 a_y$  c/m<sup>2</sup> and the rectangular parallelepiped formed by the planes  $x=0, x=1, y=0, y=2$  &  $z=0, z=3$ .

- Q3.** Derive the boundary conditions of the normal and tangential components of electric field at the inter face of two media with different dielectrics.

**(OR)**

- Q4.** (a) Derive an expression for the capacitance of a parallel plate capacitor having two dielectric media.

- (b) The capacitance of the conductor formed by the two parallel metal sheets, each 100 cm<sup>2</sup> in Area separated by a dielectric 2 mm thick is  $2 \times 10^{-10}$   $\mu$ F. A potential of 20 kV is applied to it .find

(i) Electric flux

(ii) Potential gradient in kV/m

(iii) The relative permittivity of materials

(iv) Electric flux density.

- Q5.** (a) Find an expression for Magnetic field intensity at any point due to a long, straight conductor carrying  $I$  amperes.  
(b) A filamentary conductor is formed into an equilateral triangle with sides of length ' $L$ ' carrying a current ' $I$ '. Find the magnetic field intensity at the center of the triangle.

(OR)

- Q6.** Derive the expressions for magnetic field intensity and magnetic flux density due to circular coil.

- Q7.** (a) Find the maximum torque on an 52 turns, rectangular coil with dimension  $(0.2 \times 0.3)$  m, carrying a current of 5 Amps in a field  $B = 4.8$  Tesla.  
(b) Derive an expression for Magnetic vector potential.

(OR)

- Q8.** Derive the expression for force on a straight and a long current carrying conductor placed in a magnetic field.

- Q9.** (a) Explain the concepts of statically and dynamically induced EMFs.  
(b) Derive the expression for poynting vector.

(OR)

- Q10.** (a) Derive an expression for the self-inductance of solenoid.  
(b) Obtain the Maxwell's equation derived from Faraday's law both in Integral and point forms.

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1. Distinguish between a ideal fluid and real fluid.
2. Give examples for body forces
3. What is the work done for force exerted by the Jet on a stationary vertical plate?
4. Define Hydraulic efficiency of turbine.
5. Write the expansion of NPSH.

**II. Answer ALL questions of the following****10x2Mark=20 Marks**

1. What does the smoke emitting from a lighted cigarette represent, streamline or path line or streak line? Why?
2. Write the relation between absolute pressure, atmospheric pressure and gauge pressure.
3. Differentiate between pitot tube and pitot static tube
4. What is meant by equivalent pipe
5. What is a free Jet of liquid?
6. What are the different types of hydropower plants?
7. Define the terms: Flow ratio and Jet ratio.
8. Write three functions of draft tube.
9. Define NPSH in pumps.
10. Differentiate between centrifugal pump and reciprocating pump.

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

1. a) What is the difference between dynamic Viscosity and Kinematics Viscosity? State their units of Measurements. [4M]
- b) A plate having an area of  $0.6\text{m}^2$  is sliding down the inclined plate at  $30^\circ$  to the horizontal with a Velocity of  $0.36\text{ m/sec}$ . There is a cushion of fluid  $1.8\text{mm}$  thick between the plate and the plane. Find the Viscosity of the fluid if the weight of the plate is  $300\text{N}$ . [6M]

**OR**

2. a) Define streamline. What do these lines indicate? How the streak lines differ from stream lines?
- b) The hydraulic lift in a car repair shop has an output diameter of  $300\text{ mm}$  and is to lift cars up to  $20\text{kN}$ . Determine the fluid gauge pressure that must be maintained in the reservoir. .

3. a) With a neat sketch explain the working principle of turbine flow meter. [4M]  
b) Three pipes 300m long, 300mm diameter, 150m long, 200mm diameter and 200m long, 250mm diameter are connected in series in the same order. Pipe having 300mm diameter is connected to reservoir. Water level in the reservoir is 15m above the pipe axis which is horizontal. The respective friction factors for the three pipes are 0.018, 0.02 and 0.019. Determine flow rate. [6M]

OR

4. How does a venturimeter differ from an orifice meter? Derive an expression for measurement of flow rate across a venturimeter?  
5. a) Explain in brief (i) Hydrodynamic force and (ii) Work done and Efficiency. [4M]  
b) A Jet of water of diameter 50mm moving with a velocity of 20m/sec strikes a fixed plate in such a way that the angle between the Jet and the plate is  $60^\circ$ . Find the force exerted by the Jet on the plate. (i) in the direction normal to the plate. (ii) in the direction of the plate [6M]

OR

6. A jet of water having a velocity of 35m/s impinges on a series of vanes moving with a velocity of 20 m/s. The jet makes an angle of  $30^\circ$  to the direction of motion of vanes when entering and leaves at an angle of  $120^\circ$ . Draw the velocity triangles at inlet and outlet and find  
a) The angles of vanes tip so that water enters and leaves without shock.  
b) The work done for N of water entering the vanes and  
c) The efficiency  
7. a) Define and derive the equations of various unit quantities of a turbine. (6M)  
b) A hydro turbine is required to give 25MW at 50m head and 90 RPM runner speed. The laboratory facilities available to permit testing of 20 KW model at 5m head. What should be the model runnerspeed and model to prototype scale ratio. (4M)

OR

8. a) Explain with neat Sketch twodifferenttypes of draft tubes. [6M]  
b) Discuss the working proportions of a Pelton wheel turbine [4M]  
9. a) With neat sketches explain the concept of pumps in series and pumps in parallel.  
b) A centrifugal pump is to discharge  $0.118 \text{ m}^3/\text{sec}$  at a speed of 1450 RPM against a head of 25m. The impeller diameter is 250mm, its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at outlet.

OR

10. a) Find the number of pumps required to lift water from a deep well under a total head of 89 m. All the pumps are identical and are running at 800 r p m. The specific speed of each pump is given as 25 while the rated capacity of each pump is  $0.16 \text{ m}^3/\text{s}$ .  
b) Explain the ideal indicator diagram with a neat sketch.