# ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
## (AUTONOMOUS)
B. Tech II Semester Regular Examinations May - 2016
**(Regulations: R15)**
## ELEMENTS OF ELECTRICAL ENGINEERING
**(Common for CSE & IT)**

| Date: | Time: 3 hours | Max Marks: 60 |
|---|---|---|

**Answer ONE Question from each Unit**
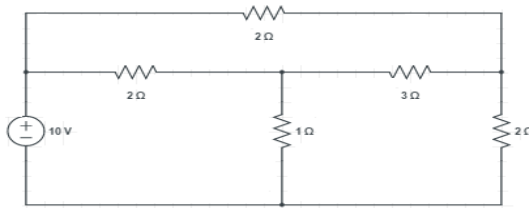**All Questions Carry Equal Marks**
**All parts of the question must be answered in one place only**

## UNIT-I

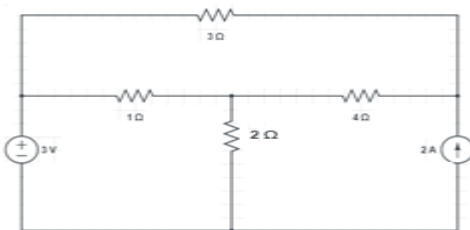1    a)    Define (i) KCL. (ii) KVL                                                (2 M)

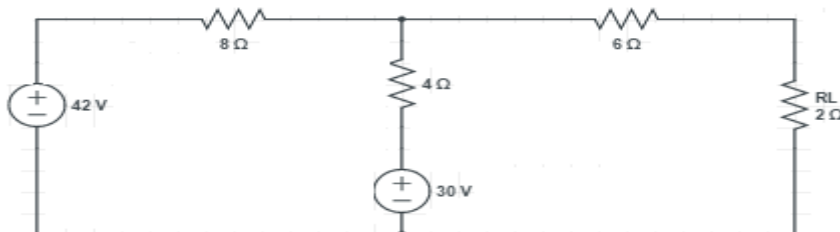b)    Find Mesh currents using Mesh Analysis for the given circuit.            (5 M)



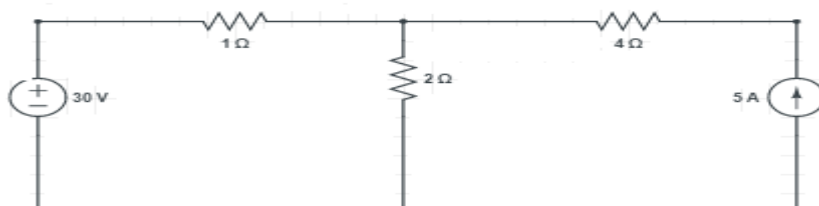c)    Find the branch currents in the circuit using Nodal Analysis.           (5 M)



**OR**

2    a)    Convert the given circuit into Thevinins and Nortons equivalent circuits.    (6 M)



b)    Find the current in the 2Ω resistor by using Superposition Theorem.       (6 M)

## UNIT-II

3   a) Define Reluctance, Permeability, Magnetic Flux Density and MMF.   (6 M)

   b) An iron ring of cross sectional area of 6 cm$^2$ is wound with a wire of 100 turns and has a saw cut of 2 mm. Calculate the magnetising current required to produce a flux of 0.1 mwb if the mean length of magnetic path is 30 cm and $\mu_r$ of iron is 470.   (6 M)

**OR**

4   a) Explain Faraday's laws of electromagnetic induction, Dynamically induced EMF and Statically induced EMF.   (6 M)

   b) An air cored solenoid having diameter of 4 cm and a length of 60 cm is wound with 4000 turns. If a current of 5 amps flows in the solenoid, Calculate the inductance of the solenoid.   (6 M)

## UNIT-III

5   a) Explain the working principle of DC Generator?   (4 M)

   b) A 100 KW, 240 V DC Shunt generator has a field resistance of 55 ohms and armature resistance of 0.067 ohms. Find the full load generator voltage?   (8M)

**OR**

6   a) Derive the emf equation of DC Generator?   (5 M)

   b) A 4- pole lap wound armature has 120 slots with 4 conductors per slot the flux per pole is 50 mwb and it generates 240V. Find the speed?   (7 M)

## UNIT-IV

7   a) Explain the principle and operation of DC motor.   (4 M)

   b) A 100V DC series motor takes 45 amps from the supply when running at 750 rpm its armature resistance is 0.22Ω while the series field resistance is 0.13Ω. Calculate the total torque developed.   (8 M)

**OR**

8   a) Derive the torque equation of DC motor?   (6 M)

   b) Explain the working of stepper motor?   (6 M)

## UNIT-V

9   a) Derive the EMF equation of a transformer.   (6 M)

   b) A 10 KVA, 2000/400V single phase transformer has the following data: $R_1 = 5Ω$, $X_1 = 12Ω$, $R_2 = 0.2Ω$, $X_2 = 0.48Ω$. Determine the secondary terminal voltage at full load at 0.8 pf lagging when the primary supply voltage is 2000V.   (6 M)

**OR**

10  a) Explain the working of 3-Φ induction motor.   (6 M)

   b) Mention the various differences between squirrel cage and slip ring induction motors.   (6 M)

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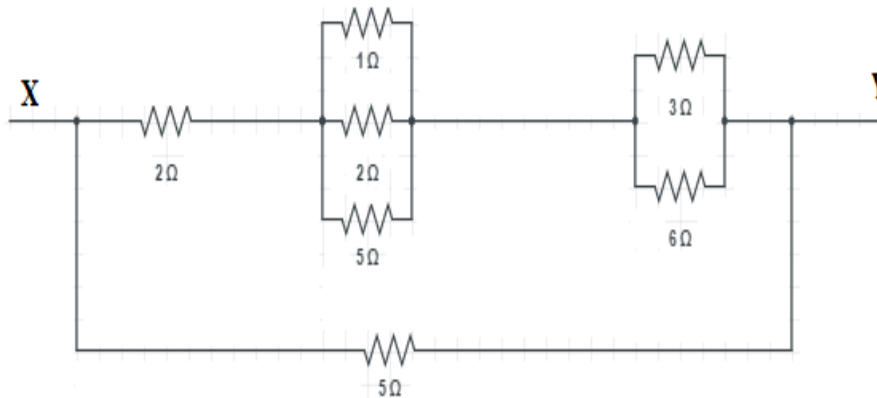**Date:**                               **Time: 3 hours**                               **Max Marks: 60**

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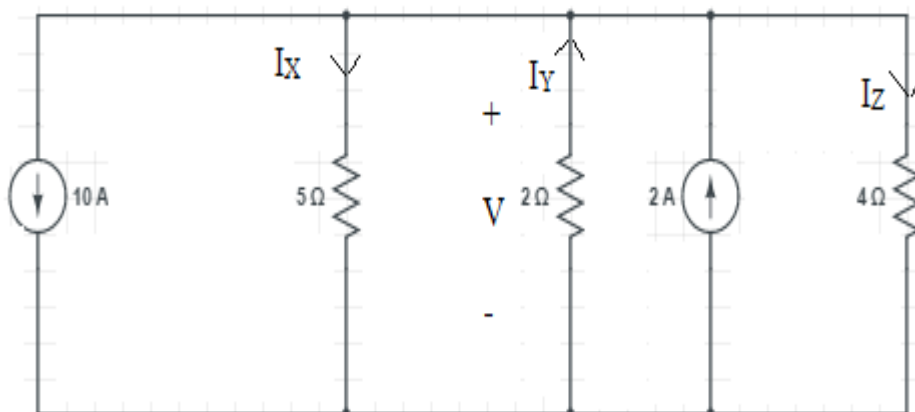**All parts of the question must be answered in one place only**
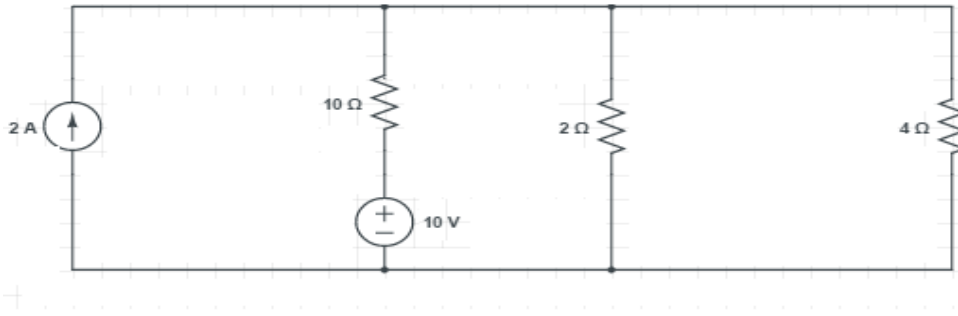
### UNIT-I

1   a)   Find the equivalent resistance across x-y to the circuit.                               (2 M)



   b)   Find V and the magnitude and direction of the currents $I_X$, $I_Y$ and $I_Z$ in the     (4 M)
        given circuit
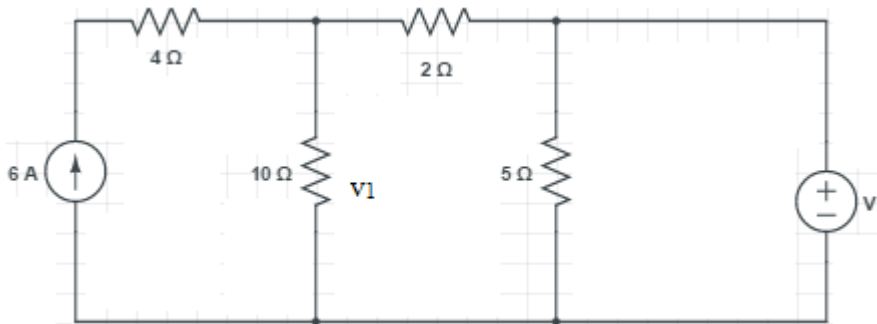
c) Find the powerloss in the 4Ω resistor by Thevenins theorem                    (6 M)



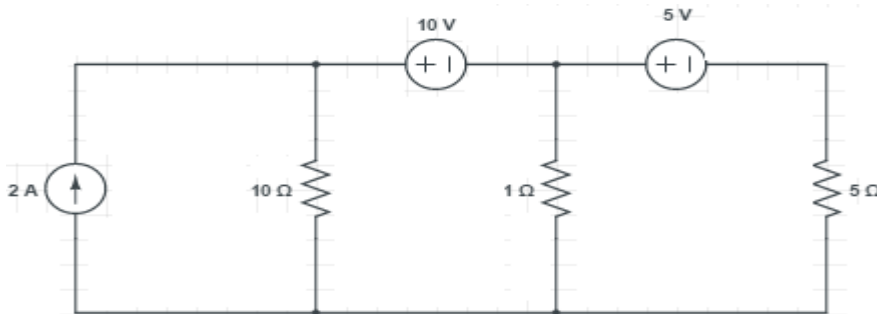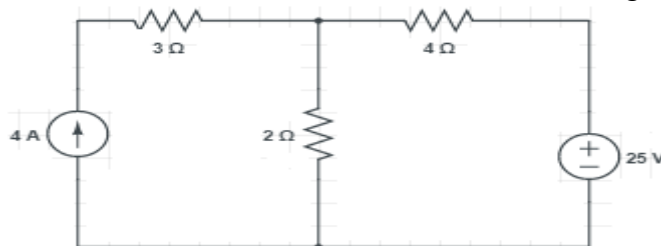**OR**

2  a) Find V, if V₁= 20V in the given circuit                                    (4 M)



b) Find the current & power dissipated in 5Ω resistor in the given circuit.      (4 M)



c) Find the current in 2Ω resistor for the circuit using superposition theorem   (4 M)



## UNIT-II

3  a) Define magnetic flux, permeance and magnetic flux intensity.               (6 M)

b) A ring composed of three sections the cross section area is $0.001m^2$ for each  (6 M)
section. The mean lengths are $L_a$= 0.3m ,$L_b$= 0.2m $L_c$=0.1m an air gap
length of 0.1mm is cut in the ring $\mu_r$ for sections a,b,c are 5000, 1000 and
10000 respectively. Flux in air gap is $7.5*10^{-4}$wb. Find mmf current if
N=100 and reluctances of all sections.

**OR**

4 a) Explain dynamically and statically induced EMFs. (4 M)

b) Two identical coils A and B of 1000 turns, each lie in parallel such that 80% of flux produced by one coil links with other. A current of 5 amps flowing in coil A produces a flux of 0.05mwb in it. If the current in coil A changes from 12 amps to -12 amps in 0.02 sec. Calculate the mutual inductance and induced emf in coil B (8 M)

## UNIT-III

5 a) Explain the construction of the DC generator. (6 M)

b) A 6 pole lap wound DC generator has 600 conductors on its armature the flux per pole is 0.02wb calculate (i) speed at which generator must run to generate 300V(ii) what would be the speed if the generator is wave wound. (6 M)

**OR**

6 a) Derive the condition of maximum efficiency in a DC Generator. (6 M)

b) A shunt generator supplies 96 amps at a terminal voltage of 200V the armature and the shunt field resistance of $0.1\Omega$ and $50\Omega$ respectively. The iron and friction losses are 2500 watts. Find generated emf copper losses and commercial efficiency (6 M)

## UNIT-IV

7 a) Explain the significance of back emf in DC motor. (4 M)

b) Calculate the value of torque established by the armature of a 4 pole motor having 774 conductors two paths in parallel 24mwb flux per pole when total armature current is 50 amps. (8 M)

**OR**

8 a) Explain the different types of DC motors with neat sketches. (6 M)

b) A 230 V DC shunt motor takes 5 amps at no load and runs at 1000 rpm. Calculate the speed when loaded and taking a current of 30 amps. The armature and field resistances are $0.2\Omega$ and $230\Omega$ respectively. (6 M)

## UNIT-V

9 a) Explain the working principle and operation of a single phase transformer. (6 M)

b) An ideal 25 KVA transformer has 500 turns on primary winding and 40 turns on the secondary winding. The primary is connected to 3000 V 50 Hz supply. Calculate a) primary and secondary currents on full load, b) secondary emf and c) the maximum core flux. (6 M)

**OR**

10 a) Explain the types of 3 phase induction motors with applications. (6 M)

b) A three phase induction motor is wound for 4 poles and is supplied from 50 Hz system. Calculate a) the synchronous speed b) the speed of the motor when slip is 4% c) rotor frequency when the motor runs at 600 rpm. (6 M)