

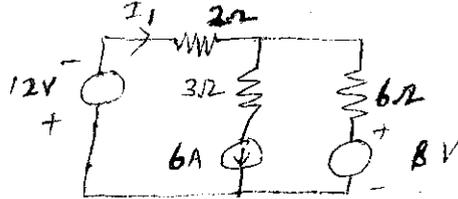
## ***B.Tech Degree I & II Semester Examination in Marine Engineering June 2010***

### **MRE 107 FUNDAMENTALS OF ENGINEERING I (B) ELECTRICAL ENGINEERING**

Time : 1 ½ Hours

Maximum Marks : 50

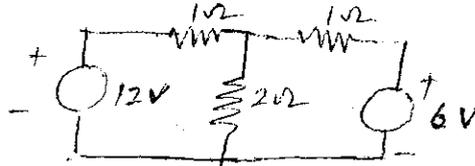
- I. (a) State and explain Kirchoff's laws. (8)  
 (b) Determine the current  $I_1$  in the circuit shown below by superposition theorem. (8)



- (c) What are ideal voltage and current sources? (2)

**OR**

- II. (a) State and prove maximum power transfer theorem. (10)  
 (b) Determine the current through  $2\Omega$  resistor in the network below by applying Thevenin's theorem.



(8)

- III. (a) Define Electric Field Strength and Electric Flux Density. What is the relation connecting these two? (6)  
 (b) A capacitor consists of two parallel rectangular plates each 120mm square separated by 1mm in air. When a voltage of 1000V is applied between the plates an average current of 12 mA flows for 5 sec. Calculate

- (i) the charge on the capacitor  
 (ii) the electric flux  
 (iii) the electric flux density  
 (iv) the electric field strength in the dielectric. (10)

**OR**

- IV. (a) What is Faraday's law of Electromagnetic Induction? Distinguish between statically and dynamically induced emfs. (6)  
 (b) A coil of insulated wire of 500 turns and of resistance  $4\Omega$  is closely wound on an iron ring. The ring has a mean diameter of 0.25m and a uniform cross-sectional area of  $700\text{ mm}^2$ . Calculate the total flux in the ring when a d.c supply at 6V is applied to the ends of the winding. Assume a relative permeability of 550. Explain the general effect of making a small air gap by cutting the iron ring radically at one point. (10)

- V. (a) Define r.m.s value and average value of an alternating current. Obtain the r.m.s value of a sinusoidal quantity. (8)  
 (b) Explain the generation of alternating voltages. (8)

**OR**

- VI. (a) A resistance of  $60\Omega$  is connected in series with a 120MF capacitor across a 230V, 50Hz supply. Determine  
 (a) the current through the circuit  
 (b) the phase difference between voltage and current  
 (c) the voltage across the resistor  
 (d) the voltage across the capacitor  
 (e) the power consumed in the circuit (8)  
 (b) With the help of vector diagrams, derive the relation connecting line voltage (current) and phase voltage (current) in a three phase star (delta) connected system. What is the expression for power? (8)

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