F.E. (Sem. – I) (RC 2016-17) Examination, November/December 2018
**FUNDAMENTALS OF ELECTRICAL ENGINEERING**

Duration : 3 Hours   Total Marks : 100

Instruction : Answer **any two** questions from **each** of Part – **A** and
B and **one** from Part – **C**.

PART – A

1. a) What is the significance of non-conventional energy sources ? Explain
major components of solar power plant, with neat block diagram.   **8**

   b) Derive equivalent expression for :   **6**

      1) n equal inductances in parallel

      2) n equal capacitors in series

      3) n equal resistors in parallel.

   c) Find charge and voltage across each capacitor.   **6**
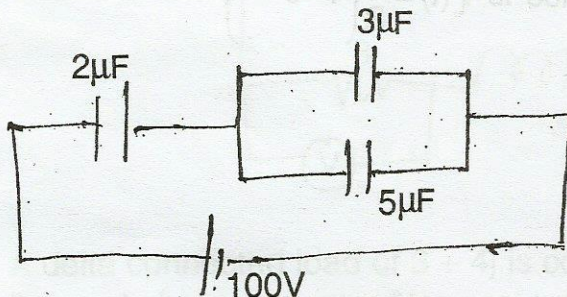
2. a) Explain the analog between electrical and magnetic circuit.   **4**

   b) Use nodal analysis to find current in following circuit :   **8**
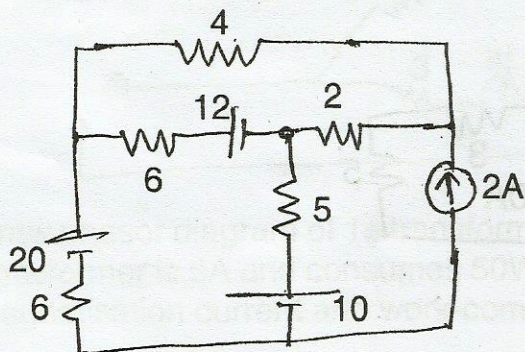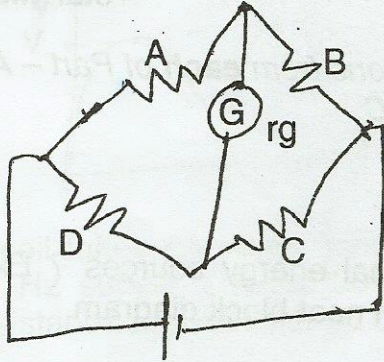
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c) Explain Thevenin's theorem. Using Thevenin's theorem, find the bridge balance condition. Take the galvanometer resistance r_g.   **8**
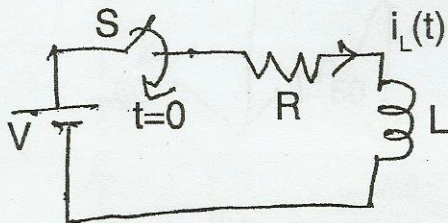

3. a) Find the inductance of solenoid with N turns and carrying current I. L-length of solenoid, A-cross section.   **6**
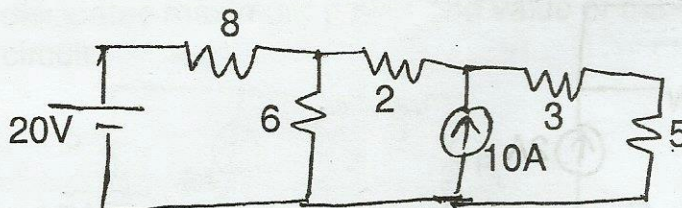
b) Show that the current in inductance is $i_L(t) = \dfrac{V}{R}\left(1 - e^{-\frac{R}{L}t}\right)$ after switch S is closed at t = 0.   **8**

c) Use superposition theorem to find current in 5Ω resistor.   **6**
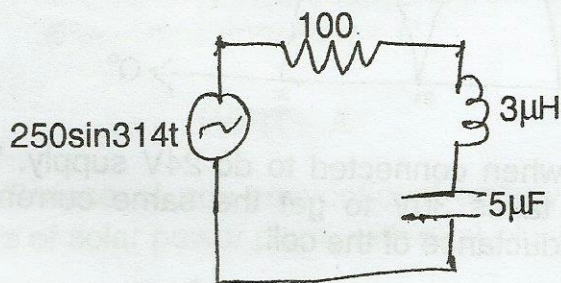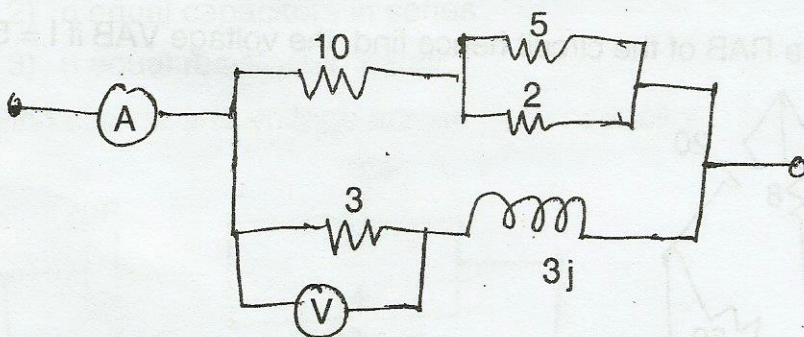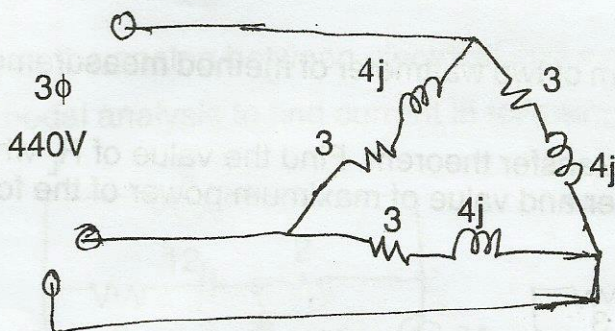
PART – B

4. a) Find the average and RMS value of sine wave. **6**

   b) What do you mean by lagging and leading power factor ? Find active, reactive and total power in following circuit : **8**

   c) A voltmeter placed as shown reads 45V. What is the ammeter reading ? **6**

5. a) A delta connected load of 3 + 4j is connected to balanced 3ϕ supply. Find line and phase currents. Also compute the power absorbed. **8**


   b) Draw phasor diagram of 1ϕ transformer on no-load : The no-load current of transformer is 5A and consumes 50W at 250 V. Find no-load power factor, magnetisation current and work-component of I_r, no-load current I_w. **8**

   c) What do you mean by phase sequence in 3ϕ system ? **4**

6. a) Find the condition of maximum efficiency of single phase transformer.   **6**

   b) Find the average and RMS value of full-rectifier output as shown   **8**
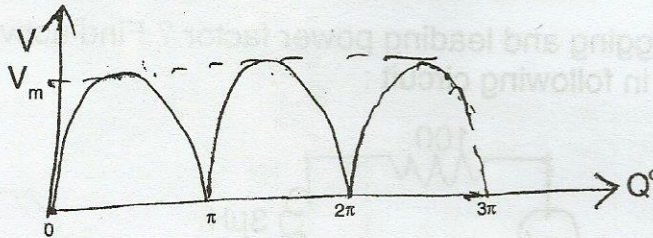
   c) A coil takes 6A when connected to dc 24V supply. When connected to 50 Hz supply it takes 30V to get the same current. Find impedance, resistance and inductance of the coil.   **6**

PART – C

7. a) Give line representation of power system with generation, transmission and distribution.   **8**

   b) Find the resistance RAB of the circuit hence find the voltage VAB if I = 5A.   **8**
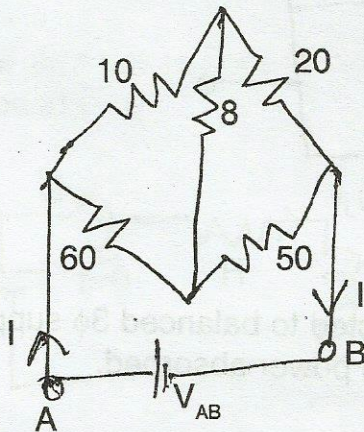
   c) Draw a neat circuit diagram of two wattmeter of method measurement of 3ϕ power.   **4**

8. a) Explain maximum power transfer theorem. Find the value of R_L which dissipates maximum power and value of maximum power of the following circuit.   **8**
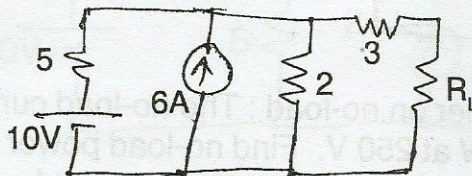
   b) Derive the emf equation of transformer.   **6**

   c) Explain the concept of mutual inductance and co-efficient of coupling. What is the relation between the above two ?   **6**

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