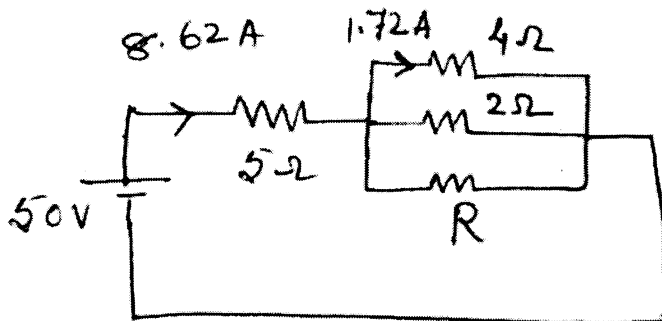


(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Answer any **four** questions from remaining **six** questions.
 (3) **Figures** to the **right** indicate **full** marks.
 (4) Assume **suitable** data if **necessary**.

1. (a) Write down the conditions of series resonance. Plot frequency versus current. 3
 (b) Find the value of unknown resistor 3



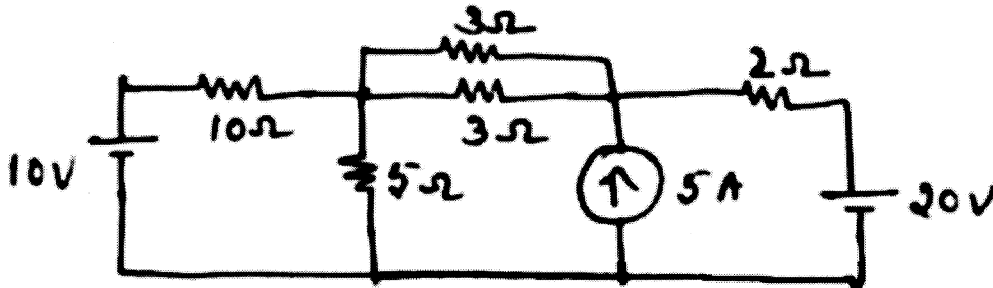
- (c) 3
-

Find the Thevenin's equivalent circuit across AB.

- (d) Define R.M.S. value. 2
 (e) Write down the phase-line relationship in star and delta connection. 2
 (f) Derive the e.m.f. equation of a single phase transformer. 3
 (g) What is the working principle of DC generator? 2
 (h) Draw and explain the V-I characteristics of Zener diode. 2

2. (a) Determine the current through 10Ω resistor using Nodal analysis

6



- (b) An ac circuit consists of a pure resistance and an inductive coil connected in series. The power dissipated in the resistance and in the coil are 1000 W and 200 W respectively. The voltage drop across the resistance and the coil are 200 V and 300 V respectively. Calculate the following :-

6

- (i) Resistance of the pure resistor.
- (ii) Resistance and reactance of the coil.
- (iii) Power factor of the coil and the total circuit.

- (c) Each phase of star connected load consist of a 50 mH inductor connected in series with 50Ω resistor. The load is connected to a three phase 400 V, 50 Hz supply.

8

Find :-

- (i) Phase current
- (ii) Line current
- (iii) Power drawn
- (iv) Power factor.

3. (a) The open circuit and short circuit test reading of a 10KVA, 450/120 V, 50 Hz single phase ac transformer are as follows :-

8

O.C test (L.V side) $V_o = 120V$, $I_o = 4.2 A$, $W_o = 80W$

S.C test (H.V side) $V_{sc} = 9.65V$, $I_{sc} = 22.2A$ $W_{sc} = 120W$

Compute the following :-

- (i) Draw the equivalent circuit and mark the circuit constants.
- (ii) Efficiency and regulation at full load and 0.8 pf lag.
- (iii) The maximum efficiency at 0.8 pf lag.

- (b) Derive condition for maximum efficiency of a single phase transformer.

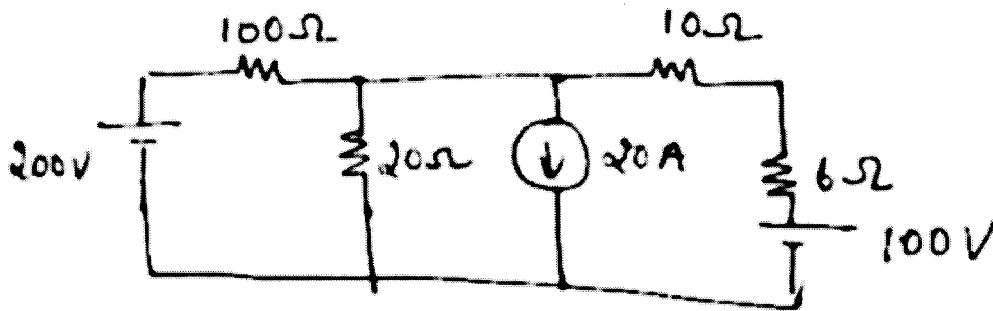
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- (c) Explain the generation of rotating magnetic field in a three phase induction motor.

8

4. (a) Find current through 100Ω using superposition theorem.

7



- (b) A coil of resistance 20Ω and inductance 0.1H is connected in series with a capacitor of $200\ \mu\text{F}$ capacitance across a supply voltage of $230\ \text{V}$, $50\ \text{Hz}$ ac. Find the resonance frequency. Also calculate the current through the circuit.

4

- (c) Two watt meters are used for measuring the power input and the power factor of a load. If the reading of the meters are $W_1 = 2\ \text{kW}$ and $W_2 = 7\ \text{kW}$, find power input and power factor.

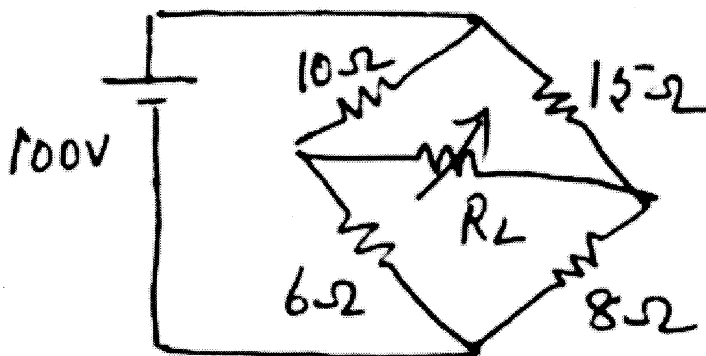
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- (d) Draw and explain the working of a single phase bridge rectifier. Derive the expression of ripple factor.

5

5. (a)

7



Find the value of R_L which deliver maximum power across it and what is the maximum power.

- (b) In an R-L-C series circuit current lags behind applied voltage by 45° . The voltage across the inductance has maximum value equal to twice the maximum value of voltage across capacitance. The voltage across inductance is $300 \sin(1000t)$ and $R = 20\Omega$. Find the values of inductance and capacitance.

5

- (c) A 5kVA distribution transformer has a full load efficiency of 95% at which copper loss is equal to iron loss. The transformer is loaded in a 24 hour period as follows :- 8

No load for 10 hrs.

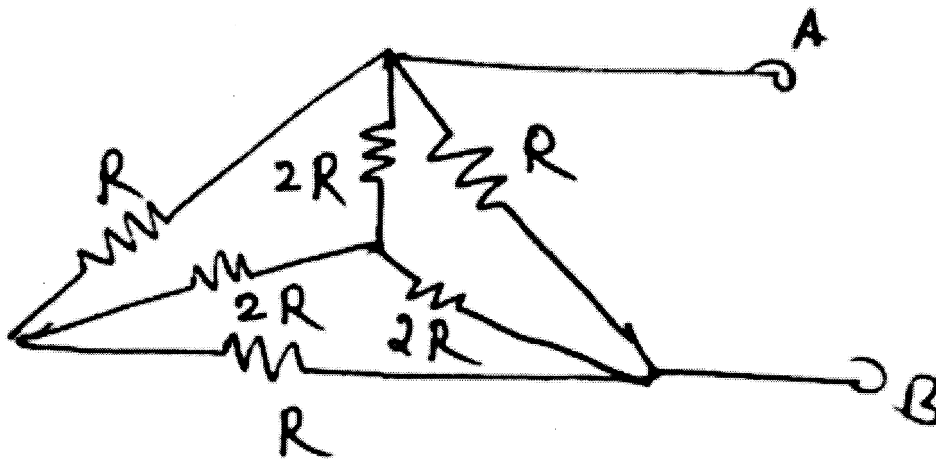
¼ full load for 7 hrs.

½ full load for 5 hrs.

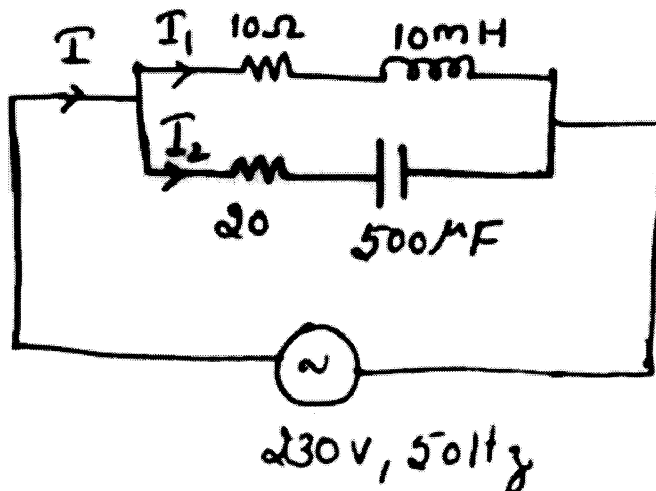
Full load for 2 hours.

Calculate the All-day efficiency of the transformer.

6. (a) Determine the resistance between A and B. 7



- (b) Find I , I_1 , I_2 and power factor of the whole circuit. 7



- (c) Show that sum of the reading of wattmeter in a two wattmeter power measurement method gives active power. Draw circuit diagram and phasor diagram. 6

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7. (a) Draw complete phasor diagram of a single phase transformer connected to a lagging load. **5**
- (b) Explain double field revolving theory for single phase induction motor. **5**
- (c) Draw the experimental setup of a common emitter configuration and explain input and output characteristics. **5**
- (d) Draw power triangle for R-L circuit and mark all the sides. Write down the equation and units of all power. **2**
- (e) Define cycle, time period, frequency, phase and phase difference with respect to an ac circuit. **3**
-