(REVISED COURSE) QP Code : **11943**
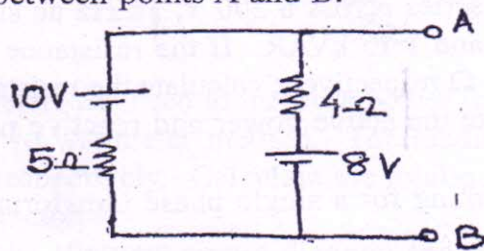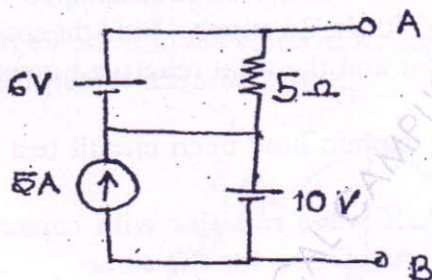
(3 Hours) [Total Marks : 80

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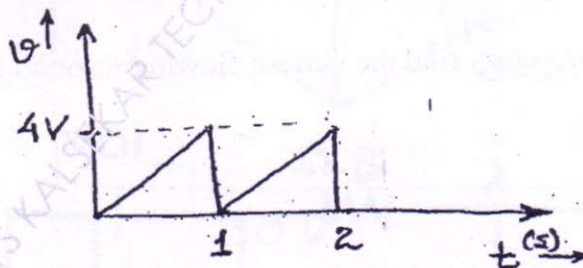   (4) Assume suitable **data** if **necessary**.

1. (a) Convert the given circuit into a single current source in parallel with a single resistance between points A and B.   **3**

(b) Find voltage V_{AB} using super position theorem.   **3**

(c) Find the average value of the following waveform :—   **3**

(d) For a series RLC circuit having R = 10 Ω, L = 0·01 H and C = 100 μF, find the resonant frequency, quality factor and bandwidth.   **3**

(e) Draw the phasor diagram for 3-phase star connected load with a leading power factor. Indicate line and phase voltages and currents.   **2**

(f) A 5 kVA, 240/2400 V, 50 Hz single phase transformer has the maximum value of flux density as 1·2 Tesla. If the e.m.f. per turn is 8 V. Calculate the number of primary and secondary turns and the primary and secondary current at full load.   **4**

(g) Draw the circuit diagram and the input and output waveforms for a full wave bridge rectifier.   **2**

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2. (a) Find the current through 4 Ω resistance using Nodal analysis.   6
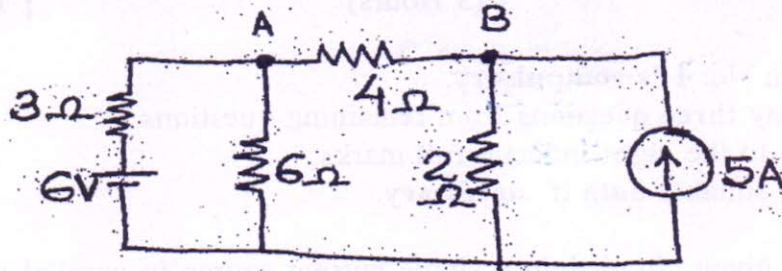

(b) Two coils are connected in series across a 200 V, 50 Hz ac supply. The power   8
input to the circuit is 2 kW and 1·15 kVAR. If the resistance and the reactance
of the first coil are 5 Ω and 8 Ω respectively, calculate the resistance and reactance
of the second coil. Calculate the active power and reactive power for both the
coils individually.

(c) Explain the principle of working for a single phase transformer and derive the   6
e.m.f. equation for the same.

3. (a) A balanced 3-phase load consists of 3 coils, each of resistance 4 Ω and inductance   8
0·02 H. It is connected to a 440 V, 50 Hz, 3φ supply. Find the total power consumed
when the load is connected in star and the total reactive power when the load is
connected in delta.

(b) With the help of a neat diagram explain how open circuit test is conducted on a   6
single phase transformer.

(c) Draw the circuit diagram of a half wave rectifier with capacitor filter and the   2
corresponding input and output waveforms for the same.

(d) With help of a neat diagram explain the input characteristics of an NPN transistor   4
in the common emitter configuration.

4. (a) Using source transformation find the current flowing through the 10 Ω resistance.   7

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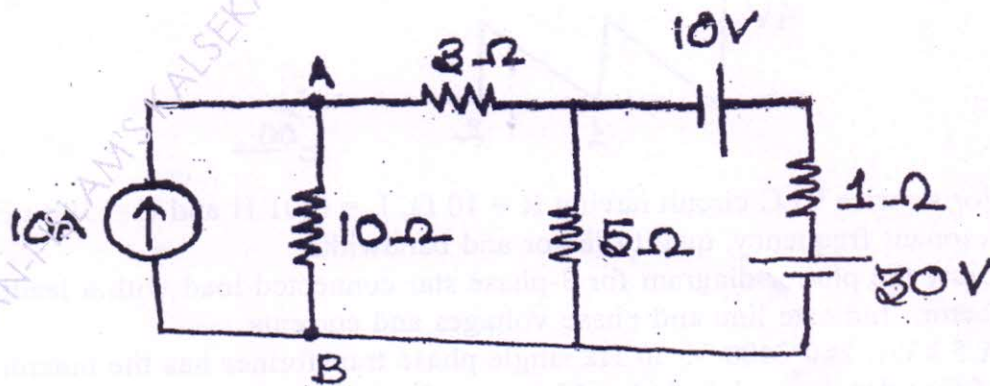
(b) Find the r.m.s. value for the given waveform.   5
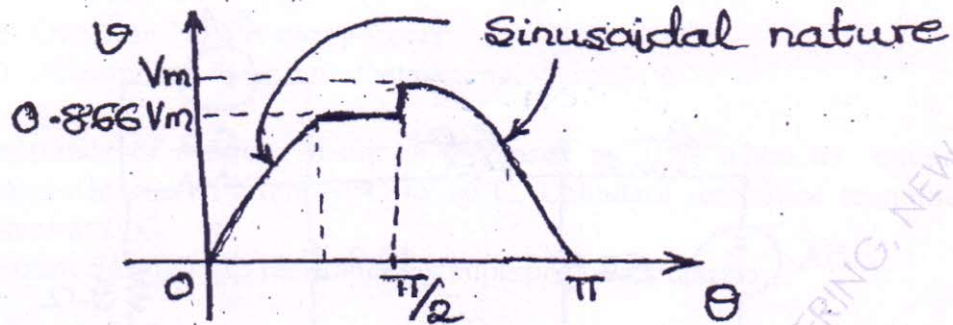
(c) Two wattmeters are used to measure power in a 3φ balanced star connected load   4
using the two wattmeter method. The readings of the 2 wattmeters are 8 kW
and 4 kW respectively. Calculate the total power consumed by the 3φ load and
the power factor.

(d) With the help of a neat circuit diagram and input and output waveforms explain   4
the working of a fullwave centre tapped rectifier.

5. (a) For the given circuit find the value of R_L for maximum power transfer and calculate   8
the maximum power absorbed by R_L.
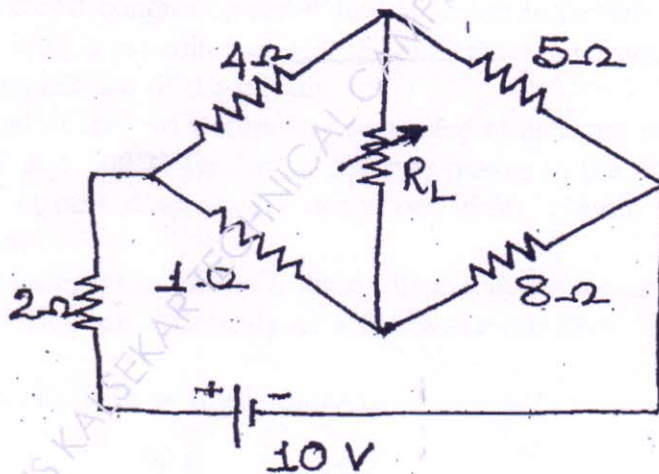
(b) The voltage and current in a circuit are given by e = 100 sin(ωt + 30°) and   4
i = 50 sin(ωt + 60°). Determine the impedance of the circuit. Assuming the
circuit to contain 2 elements in series find resistance, reactance and power factor
of the circuit.

(c) A 30 kVA, 2400/120V, 50Hz transformer has high-voltage winding resistance of   8
0·1Ω and leakage reactance of 0·22Ω. The low voltage winding resistance is
0·035Ω and leakage reactance is 0·012Ω. Calculate equivalent resistance as referred
to primary and secondary, equivalent reactance as referred to primary and secondary,
equivalent impedance as referred to primary and secondary. Copper loss at full
load and at 75% of full load.

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6. (a) Find the value of current flowing through the 5 Ω resistance using Superposition 7
Theorem.
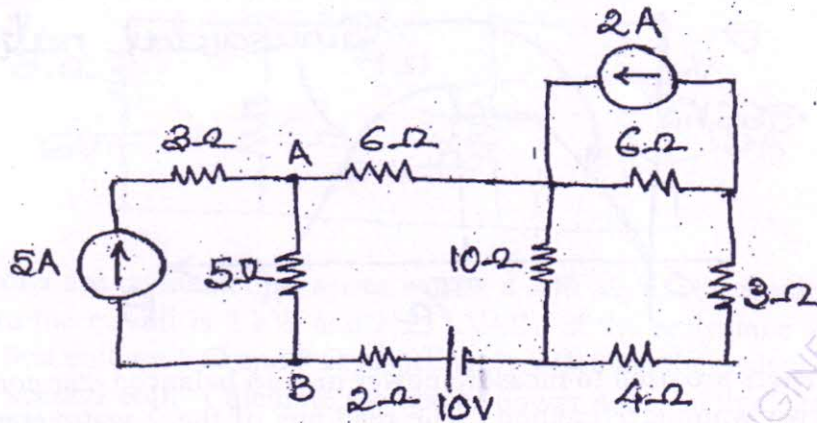
(b) An inductive coil having a resistance of 20 Ω and inductance of 0·2 H is connected 7
in parallel with a 20 μF capacitor with variable frequency and 230 V supply. Find
the frequency at which the total current drawn from supply is in phase with the
supply voltage. Find the value of the current and the impedance of the circuit at
this frequency.

(c) With the help of a neat circuit diagram and phasor diagram explain the 2-wattmeter 6
method to measure power in a 3-phase balanced delta connected load.

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