

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Basic Electrical Engineering

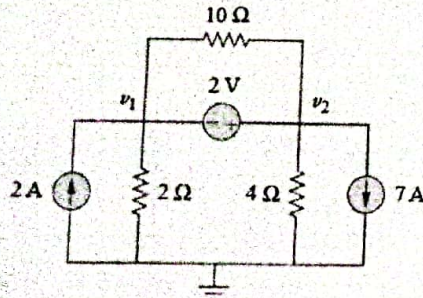
Semester: Fall
Year : 2022
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

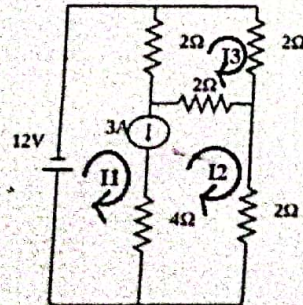
The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What are nodes and loop in electric circuit? For the given electric circuit, use nodal analysis to find the current through, voltage across and power consumed by the load having resistance $4\ \Omega$.

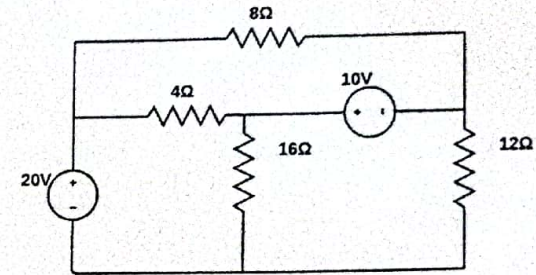


- b) Using mesh analysis, determine the power dissipation in $4\ \Omega$ resistor.

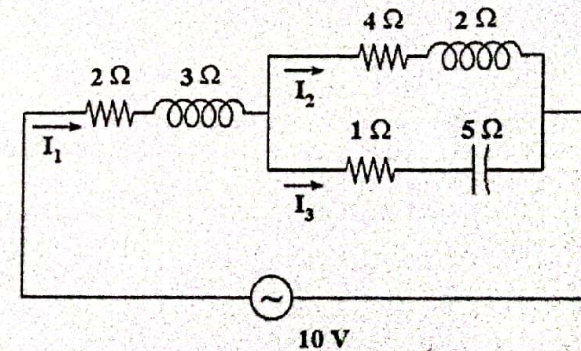


2. a) Using Thevenin's theorem, find the power absorbed by $12\ \Omega$ resistor.

1



- b) State and prove maximum power transfer theorem. What is the power transfer efficiency under maximum power transfer conditions?
3. a) For the electric circuit shown below, find: i) supply current and branch currents ii) voltage across each branch iii) Active, reactive and apparent power of entire circuit iv) overall power factor v) Draw phasor diagram showing the currents and supply voltages.



- b) What is electric resonance? Explain the resonance in series RL-C circuit and find the expression of resonant frequency and current at resonance.

OR

A voltage $v(t) = 100 \sin 314t$ is applied to a series circuit consisting of $10\ \Omega$ resistance, $0.0318\ \text{H}$ inductance, and a capacitor of $63.6\ \mu\text{F}$. Calculate the followings:

- i. Expression for $i(t)$
- ii. Power factor

2

- iii. Active, reactive, and apparent power
 - iv. Also draw the phasor diagram.
4. a) A balanced star-connected load of $(8+j6) \Omega$ per phase is connected to a balanced three-phase 400 V supply. Find the line current, power factor, reactive power, and total volt-amperes. 8
 - b) Prove that for delta connected 3 phase balance system line current is $\sqrt{3}$ times of phase current but line and phase voltage is equal. 7
 5. a) The following data were obtained on a 20 kVA, 50 Hz, 2,000/200 V distribution transformer. 10
 OC Test: 200 V, 4 A, 120 W
 SC Test: 60 V, 10 A, 300 W
 - i) Determine the equivalent circuit parameters referred to high voltage and low voltage side. Also, draw the equivalent circuit.
 - ii) Determine the voltage regulation at 0.8 pf lagging.
 - iii) Calculate efficiency at full load condition at 0.8 p.f. lagging
 - b) An inductive coil of resistance 10 Ohm and inductance 0.1 H is connected in parallel with a 150 μ F capacitor to a variable frequency, 200 V supply. Find the resonant frequency at which the total current taken from the supply is in phase with the supply voltage. Also, find the value of this current. 5
 6. a) What is transformer? Explain two major application area of transformer. Find the EMF equation of transformer. 7
 - b) A 220 V dc shunt motor runs with 1500 rpm with an armature current of 60 A. The value of armature resistance is 0.9 Ω . What value of resistance is to be inserted in series with the armature so that the speed drops to 1000 rpm? 8

OR

A 20 hp, 250 V DC shunt motor drives a load that requires a constant torque regardless the speed of operation. The armature resistance is 0.1 Ω . When this motor is running at full load, the armature current is 65 A at a speed of 1100 rpm. If the flux is reduced to 75% of its original value, find the armature current and the speed of the motor at this new condition?

7. Write short notes on: (Any two) 2×5
 - a) Generation, transmission and distribution of electricity using single line diagram
 - b) Working principle and uses of three phase induction motor
 - c) Power factor and its significance