

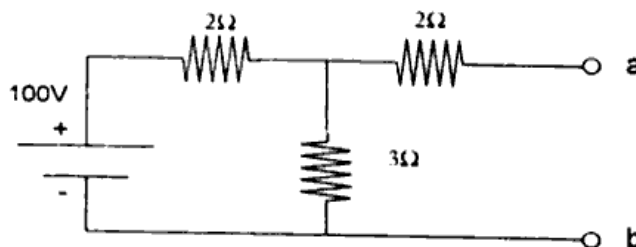
1st Semester Regular/Back Examination: 2022-23
Basic Electrical Engineering
AEIE,AUTO,BIOMED,CHEM,CIVIL,CSE,CSEAI,CSEAIME,
CSEDS,CST,ECE,EEE,ELECTRICAL,ELECTRICAL & C.E,ETC,
IT,MECH,METTA,MINING,MME,PT/CE,CSE,EE
Time : 3 Hour
Max Marks : 100
Q.Code : L604

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Q1 Part-I (2 x 10)
Answer the following questions :

- a) Two impedances of $(3+j4) \Omega$ and $(2-j3) \Omega$ are connected in parallel, what is the equivalent impedance?
- b) Determine the open circuit voltage across the terminals 'a' and 'b' as shown in the Fig. below.



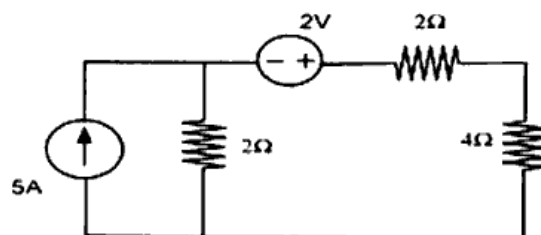
- c) What is the difference between mesh and loop in circuit analysis?
- d) Three resistances of 6Ω each are connected in delta. The value of the resistances in equivalent star is _____.
- e) In an ac circuit, if supply voltage is $V = 20 \angle -30^\circ$ and circuit current is $I = 10 \angle 30^\circ$, Calculate the real power.
- f) Write the relation between phase and line voltages, and phase and line currents for a balanced three-phase delta connected load.
- g) What do you mean by magnetic hysteresis? Write down the expression of hysteresis loss.
- h) In a 110/220 V, 1 kVA, single -phase transformer if supply frequency to HV side is 50 Hz, what is the frequency of emf induced in LV side?
- i) A 3 phase, 50Hz, 4 pole induction motor is running on full load & runs at 1460 rpm. Find the slip.
- j) What is emf generated in a 4 pole, wave wound dc shunt generator having 294

conductors rotating at 1500 rpm & flux per pole is 0.0156 wb?

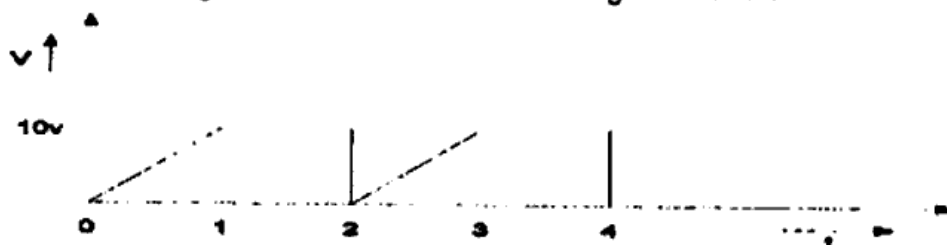
Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 × 8)

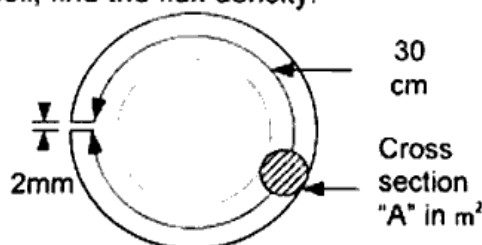
- Distinguish between independent and dependent energy sources. Enumerate the various types of dependent sources.
- Determine the current in the 4Ω resistor of the circuit shown in fig. below using Thevenin's theorem.



- Determine the average and rms value of the below given waveform.



- A circuit consists of a resistance R in series with a capacitive reactance of 60Ω . Determine the value of R for which the power factor of the circuit is 0.8.
- A resistance of 50Ω is connected in series with a pure inductor of 250 mH . The circuit is connected to a 50 Hz sinusoidal supply and the voltage across the resistance is 150 V . Calculate the supply voltage. <https://www.bputonline.com>
- Two-wattmeter method was used to determine the input power to a three-phase motor. The readings were 5.2 kW and -1.7 kW , and the line voltage was 415 V . Calculate (a) the total power (b) the power factor and (c) the line current.
- Write the similarities & dissimilarities between electrical & magnetic circuit.
- An iron ring (as shown below) of mean length 30 cm has an air gap of 2 mm and a winding of 200 turns. If the permeability of the iron core is 300 when a current of 1 A flows through the coil, find the flux density.



- A $6600/440\text{ V}$, 50 Hz single phase transformer is built on a core having an effective cross sectional area of 150 cm^2 & has 80 turns in the low voltage winding Calculate (i) The value of the maximum flux density in the core, (ii) The no. of turns in the high voltage winding.
- A 3-phase, 4 pole induction motor is supplied from 3-phase, 50 Hz AC supply.

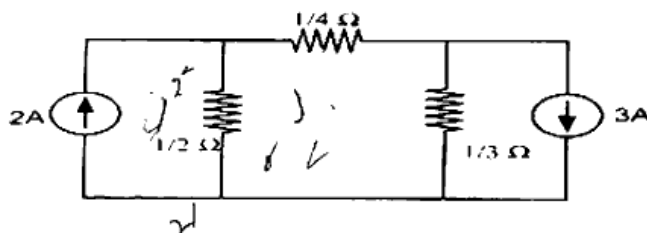
Calculate (i) synchronous speed (ii) rotor speed when slip is 4% and (iii) rotor frequency when rotor runs at 600 rpm.

- k) What are the different types of DC generators according to the ways in which fields are excited? Show the connection diagram of each type.
- l) A 6-pole, dc motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is 0.2Ω , and flux per pole is 50 mWb. The armature has 864 lap-connected conductors. Calculate (a) the speed, and (b) the gross torque developed by the armature.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3 Using the node voltage analysis for the circuit shown in Fig. below, find all the node voltages and currents in $1/2 \Omega$, $1/4 \Omega$ and $1/3 \Omega$ resistances. (16)



- Q4 A balanced star connected load of $(6 + j8) \Omega$ per phase is connected to a 3-phase, 50Hz, 415 V supply system. Calculate (i) Line current (ii) Power factor (iii) Real power (iv) Apparent power. (16)
- Q5 State the working principle of a transformer. Draw the phasor diagram of an ideal transformer under no load condition. (16)
- Q6 An 8-pole, dc shunt generator has 778 wave-connected conductors on its armature. While running at 500 rpm, it supplies power to a load of 12.5Ω at 250 V. The armature and the shunt -field resistances are 0.24Ω and 250Ω , respectively. Determine the armature current, the emf induced, and the flux per pole. (16)