

Basic Electrical Engineering - Exam

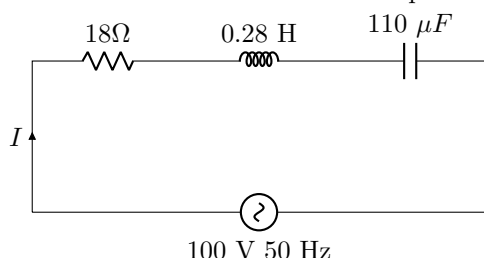
Student Name:

Roll no:

Code: IVWHPIAYWO

1 AC Circuits

1. For the circuit shown below find the value of current I in polar form



1. _____

2 Transformers

2. A single phase transformer has 600 turns on the primary and 100 turns on the secondary. The no load current is 2 A at a power factor of 0.3 lag and the secondary current is 280 A at a power factor of 0.5 lag. Neglect R_2 and X_2 . Calculate the input power factor.

2. _____

3. The SC test conducted on a 80 KVA, 1900/350 V, 50 Hz 1-phase transformer yielded results of 200 V, 2500 W, and 42.1 A, when the readings were taken on the high voltage side. Find the equivalent reactance of transformer referred to the secondary side, X_{02} . Calculate upto 3 decimal places.

3. _____

4. A 9 KVA transformer has a copper loss of 180 W and core loss of 60 W at full load. Find the efficiency (in percentage) of the transformer when the load current is 0.7 times the full load current with power factor of 0.7 lag.

4. _____

5. In a single phase 40 KVA, 2800/240 V, 70 Hz transformer, the maximum flux allowable in the core is 12 mWb. Calculate the number of turns in secondary winding. Round off your answer to the nearest integer.

5. _____

6. A single phase, 100 KVA, 2000/200 V, 50 Hz transformer has reactance drop of 9% and resistance drop of 6%. At what power factor of the load will regulation be zero.

6. _____

7. The rating of a single phase, 40 Hz, transformer is 820 KVA. When operating at full load, the load current is 45 A which lags the load terminal voltage by a power factor of 0.6. Find the magnitude of reactive power consumed by the load in KVARs.

7. _____

8. A transformer T with ratio of secondary turns to primary turns 0.91 has a weight of copper = 238 kg. The cost of copper required for another auto-transformer A with 3 times the primary turns as that of primary of T but has the same ratio of secondary turns to primary turns (0.91) and having the same corresponding currents in primary and secondary circuits (in INR)? (Cost of copper per kg = 500 INR.)

8. _____

9. A single phase 60 KVA, 4000/450 V, 30 Hz transformer has 1848 turns in its primary coil and a maximum flux density of 1.3 Tesla. Calculate the cross-section area of the core in cm^2 .

9. _____

10. No load current of a transformer is 4 A at a power factor of 0.3 lagging when connected to a 400 V,

55 Hz power supply. Calculate the magnetising component of the no load current.

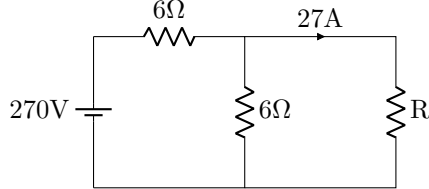
10. _____

3 DC Circuits

11. Two resistors $23\ \Omega$ and $14\ \Omega$ are in parallel. This combination is in turn connected in series with another resistance of value $9\ \Omega$. Further this entire combination is connected in parallel to another resistance of $16\ \Omega$. Find the effective resistance of the above circuit.

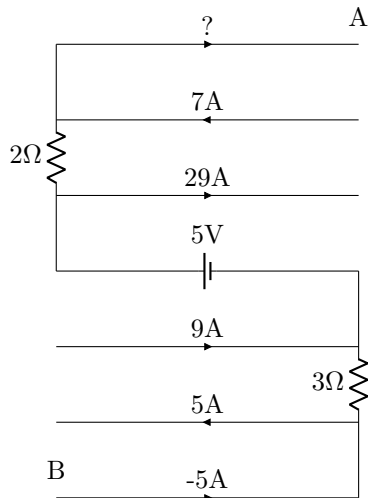
11. _____

12. In the figure below the value of R in Ohms is



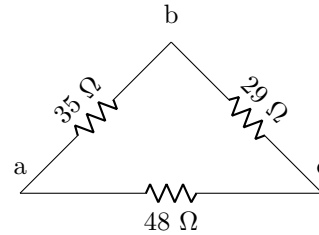
12. _____

13. Determine the value of voltage V_{AB} in the following circuit.



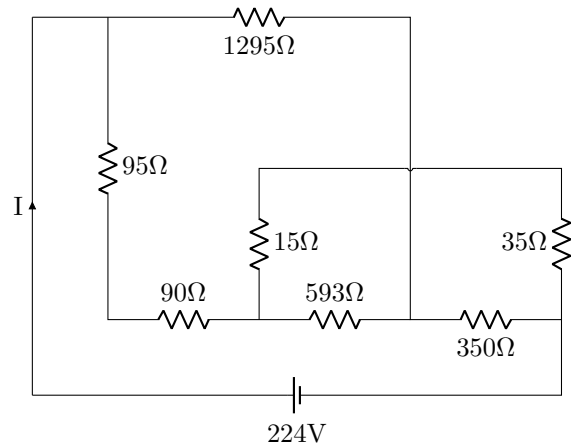
13. _____

14. Referring to the figure below, R_{max} denotes the maximum value of effective resistance measured between any two nodes out of three available nodes. Find R_{max} in Ohms.



14. _____

15. Find the current I in the given circuit. Note that there is a no-contact crossing between $35\ \Omega$ and $15\ \Omega$ resistors.



15. _____

4 Induction Motors

16. A 3-phase, 200 V, 70 Hz, 8 pole induction motor runs at 945 rpm at full load. Calculate the full load slip of the motor.

16. _____

17. A 3 ϕ induction motor is wound for 6 poles and is supplied from 45 Hz system. Calculate the synchronous speed in rpm.

17. _____

18. The power input to the rotor of a 3-phase, 50 Hz, 6 pole induction motor is 15.3 kW, the rotor copper losses are 408 **W per phase**. Calculate the speed of rotor in rpm, ignoring the mechanical losses.

18. _____

19. A 3-phase induction motor having a 6-pole, 50-Hz supply. The rotor resistance and standstill reactance are 0.12 ohm and 0.96 ohm per phase. The speed of the rotor at full load is 975 rpm. Find the ratio of the starting torque to the full load torque.
19. _____
20. A 746 kW, 3 phase, 50 Hz, 12 pole induction motor has rotor resistance and reactance at standstill of 0.11 Ω and 0.34 Ω per phase. The full load torque is obtained at 475. Find the ratio of maximum torque to full load torque.
20. _____
21. In a 3-phase, 70 Hz, 6 Pole induction motor, the rotor electromotive force is observed to make 8 complete alterations per second. Find the ratio of rotor copper loss to the mechanical power developed in the rotor. Calculate upto 4 decimal places.
21. _____
22. A 3-phase, 200V, 90 Hz induction motor runs has a synchronous speed of 1800 rpm. Calculate number of poles of the motor.
22. _____
23. A 3-phase, 500 V, 30 Hz, 8 pole induction motor has a full load slip of 3 %. Calculate the rotor speed of the motor.
23. _____
24. A 3-phase, 6 pole, 400V, 60 Hz induction motor has a full load slip of 7 %. Calculate the frequency of emf induced in the rotor at full load.
24. _____
25. A 3-phase, 500 kW, 50 Hz, 4 Pole induction motor has a rotor impedance (0.04 + j0.17) ohm at standstill. Calculate the rotor resistance to be added to get maximum starting torque.
25. _____

* * * All the Best * * *