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Total Number of Pages : 03

B.Tech /
Integrated Dual Degree (B.Tech. and M.Tech)
RBE2B001

2nd 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: M382

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.

Part-I

Q1 Answer the following questions :

(2 x 10)

- When a resistor is placed across a 230-volt supply, the current is 12 A. What is the value of resistor that must be placed in parallel to increase the load to 16 A ?
- Write the rectangular and polar form expression of the " j-operator".
- Find the equivalent impedance of two impedances $30\angle 45^\circ$ and $20\angle -30^\circ$ connected in parallel. What is the resistance of this equivalent impedance?
- State & explain briefly the Thevenin's theorem.
- The load taken by a three-phase induction motor is measured by the two-wattmeter method, and the readings are 860 W and 240 W. What is the active power taken by the motor and at what power factor is it working?
- Why 3-phase, 4 wire Y connection is used for distributing electrical power? Briefly, explain.
- Find the reluctance of an air gap of 0.5mm width and cross-sectional area of 10 cm². Consider the standard value of μ_0 .
- In a transformer, the hysteresis loss is found to be 52 Watt at 40 Hz. Compute the hysteresis loss at 50 Hz.
- State two differences between a squirrel cage and slip ring induction motor.
- Draw the symbol of a long shunt DC compound generator.

Part-II

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

- A circuit, consisting of three resistances 12 Ω , 18 Ω and 36 Ω respectively, joined in parallel, is connected in series with a fourth resistance. The whole is supplied at 60 V and it is found that the power dissipated in the 12 Ω resistance is 36 W.

Determine the value of the fourth resistance and the total power dissipated in the group.

- b) Using Norton's theorem find current flowing through the 10Ω resistor in Figure 1.

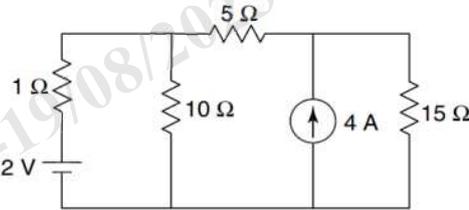


Fig.1

- c) Find the magnitude of current through 2Ω resistor by using mesh analysis method in the circuit of Fig.2.

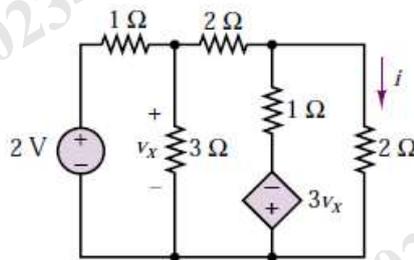


Fig.2

- d) Two impedances given by $Z_1=(10+j5)$ and $Z_2=(8+j6)$ are joined in parallel and across a voltage of $V=(200+j0)$ volts. Calculate the circuit current, power factor, its phase and branch currents. Draw the phasor diagram.
- e) Write a short note on -3 Phase power measurement by 2 wattmeter method.
- f) Three similar coils each having a resistance of 20Ω and an inductance of 0.05 Henry are connected in Delta to a 3-phase, 50 Hz, 400 V supply. Calculate i) line current, ii) power factor, iii) power absorbed iv) total apparent power.
- g) Draw the B-H curve and briefly describe about hysteresis loop.
- h) The uneven ring-shaped core shown in Fig.3 below has $\mu_r = 1000$ and the flux density in the thicker section is to be 0.75 T. If the current through a coil wound on the core is to be 500 mA, determine number of coil turns required.

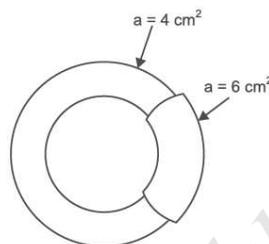


Fig.3

- i) A single phase 4 kVA transformer has 400 primary turns and 1000 secondary turns. The net cross-sectional area of the core is 60 cm^2 . When the primary winding is connected to 500 V, 50 Hz supply, calculate: (i) the maximum flux density in the core (ii) the voltage induced in the secondary winding and (iii) the secondary full load current.
- j) Explain the principle of operation and constructional features of a 3-phase Induction Motor.
- k) Derive the torque equation for a DC motor? And, justify why DC series motors are

used for high torque applications?

- l) An 8-pole dc generator has 500 armature conductors and a useful flux of 0.05 Wb per pole. What will be the emf generated if it is lap connected and runs at 1200 rpm? What must be the speed at which it is to be driven to produce the same emf if it is wave wound?

Part-III

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

- Q3** Two impedances Z_1 and Z_2 are connected in parallel across applied voltage of $(100+j200)$ volts. The total power supplied to the circuit is 5kW. The first branch takes a leading current of 16A and has a resistance of 5 ohms while the second branch takes a lagging current at 0.8 power factor. Calculate:
i) Current in second branch. ii) Total current . iii) Value of the circuit elements **(16)**
- Q4** Three equal impedances of resistance 6Ω and impedance 10Ω are connected in star and given supply from a 3-phase 400V 50Hz source. Find the Line current, Phase current and active power consumed. Also find the phase current, line current and active power consumed, if the three impedances are connected in delta. Comparing the power consumption in both the connections, what can be inferred? **(16)**
- Q5** Discuss the principle of operation of a single-phase transformer. Derive the emf equation. Also discuss the constructional features of it. **(16)**
- Q6** Draw and explain the 'torque – speed' characteristics of a three phase induction motor **(16)**