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Total number of printed pages – 3

B. Tech
BENG 1102 (Old)

Special Examination – 2012

BASIC ELECTRICAL ENGINEERING

Full Marks – 70

Time – 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 × 10
- Explain the term 'Magnetic field intensity'.
 - A circuit consist of a resistor $20\ \Omega$ in series with a capacitor $50\ \mu\text{F}$. The frequency is 50Hz , Calculate the conductance and susceptance of the circuit.
 - Define an ideal current source.
 - Write the principle of a DC Generator.
 - A square cross sectional magnet of side $4\ \text{cm}$ has a strength of $0.5\ \text{milli Webers}$. Determine the magnetic flux density.
 - Why is the efficiency of a transformer is high ?
 - What do you understand by the term 'Slip' and how it is different from the 'Slip Speed' for a 3-phase induction motor ?
 - What are the different methods for production of damping torque ?
 - What are the conventional ways of generating electrical power ?
 - What do you understand by a three-phase balanced system ?

P.T.O.

2. (a) Find the current flowing through R_L of the circuit shown below Fig. (1) by using superposition theorem. 6

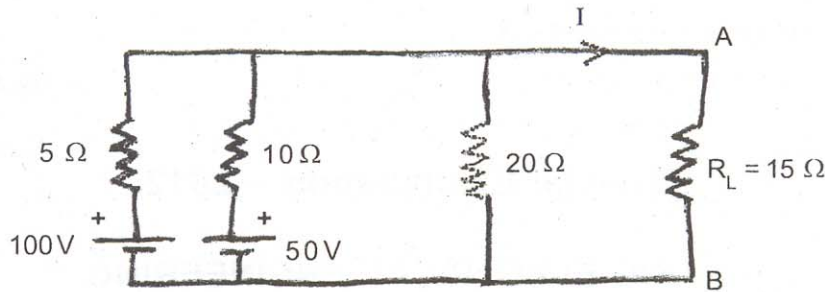


Fig. 1

- (b) What do you mean by 'time constant' of an RLC Series Circuit? 4
3. (a) A circuit consist of pure resistance and a coil in series. The power dissipated in the resistance is 500 W and voltage drop across it is 100 V. The power dissipated in the coil is 100 W and voltage drop across it is 50 V. Determine the resistance and reactance of the coil and also the supply voltage. 6
- (b) A series circuit having $R = 5\Omega$ and $L = 0.4\text{ H}$ is excited by an AC Voltage of magnitude 110 V (rms) and frequency of 50 Hz. What should be the the value of capacitance, which when connected in series with the circuit would cause resonance? Find the voltage across inductance and capacitance. What would be the Q factor of the circuit? 4
4. (a) A coil of resistance 10 ohms and inductance 0.4 H is connected to a 100 V DC supply. Find 6
- (i) The time constant
 - (ii) Final steady state value
 - (iii) Time taken for current to rise to half of its final value.
- (b) A resistor of 120Ω is connected in series with $60\mu\text{F}$ capacitor to a supply 240 V, 60 Hz. Find the voltage across the capacitor. 4
5. (a) An iron ring of 50 cm mean circumference has a cross sectional area of 10 sq cm, and has a winding of 800 turns on it. The ring has an air gap of 1 mm. It is observed that a current of 3.18 A in the winding produces a flux density of 1.2 weber/ m^2 in the air gap. Calculate 6
- (i) The relative permeability of iron
 - (ii) Inductance of the coil.

- (b) Three identical impedances of each $(8 + j6) \Omega$ are connected in star and to a 440 V, 50 Hz three phase balanced AC supply. What is the total power consumed? 4
6. (a) 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, 60 Hz supply, Calculate 6
- (i) The maximum flux density in the core.
 - (ii) The voltage induced in the secondary winding
 - (iii) The secondary full load current.
- (b) Briefly explain the various losses in DC machine: 4
7. (a) Explain briefly the construction and principle of operation of a three phase squirrel cage induction motor. Briefly explain the torque and speed characteristic. 6
- (b) A 3-phase induction motor has 4 stator poles and supplied with 50 Hz, balanced three phase supply is running on load with a slip of 4%. Calculate 4
- (i) The actual running speed
 - (ii) The synchronous speed of the machine
 - (iii) Frequency of the rotor current and also speed of the rotor rotating field with respect to stator.
8. (a) Explain how power is generated in a hydroelectric power plant by drawing a suitable diagram? 6
- (b) How can you extend the range of a PMMC instrument to be used as a Voltmeter? 4