CBCS SCHEME

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15ELE15/25

# First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
## Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

***Note: Answer any FIVE full questions, choosing ONE full question from each module.***



### Module-1

1 a. State Ohm's law and mention its limitations. **(04 Marks)**

b. Derive an expression for energy stored in a magnetic field. **(06 Marks)**

c. A circuit of two parallel resistors having resistance of 20Ω and 30Ω respectively connected in series with 15Ω resistor. If the power dissipation in 15Ω resistor is 135 watts, find:
i) Current in 20Ω, and 30Ω resistors
ii) Voltage across whole circuit and
iii) Power consumed in 20Ω resistor. **(06 Marks)**

**OR**

2 a. State and explain Kirchoff's laws. **(04 Marks)**

b. A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1m wb. Calculate: i) Self inductance ii) Induced emf iii) Energy stored when the current is reversed in 0.01 second. **(06 Marks)**

c. A coil of 1000 turns is wound on a silicon steel ring of relative permeability 1200. The ring has mean diameter of 10cms and cross-sectional area of $12cm^2$. When a current of 4 ampere flows through the coil, find:
i) Flux in the coil
ii) Inductance of the coil
iii) The emf induced in the coil if the flux falls to zero in 15 milliseconds
iv) Now if another similar coil is placed such that 70% magnetic coupling exists between the coils, find the mutual inductance. **(06 Marks)**

### Module-2

3 a. Explain the working principle of D.C. generator. **(04 Marks)**

b. Explain working principle of dynamometer type of wattmeter. **(06 Marks)**

c. The field resistance and armature resistance of a 500V, 4 pole wave connected of a 500V, 4 pole wave connected dc shunt motor are 250 ohm and 0.1 ohm respectively. The armature has 492 conductors and flux per pole is 0.05 wb. Calculate the speed and torque when the full load current is 20 amps. **(06 Marks)**

**OR**

4 a. Derive equation for the torque developed in the armature of a D.C. motor. **(04 Marks)**

b. With neat diagram, explain the working principle of inducting type energy meter. **(06 Marks)**

c. A 4 pole 1500 rpm dc generator has cup wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 wb, calculate the e.m.f generated in the armature. What would be the generated emf if the winding is wave connected? **(06 Marks)**

## Module-3

5 a. Prove that in a purely inductive circuit the current lags voltage by 90°. **(06 Marks)**

b. With the help of circuit diagram, explain the two way control of 1 amp. **(04 Marks)**

c. A 250 volts at 50Hz is applied across R.C. series, circuit. The current of 2.2A flowing through it causes a power loss of 96.8 watts in the resistor, power loss of 96.8 capacitor is negligible. Calculate the resistance and capacitance. Also find the p.f. of the circuit. **(06 Marks)**

**OR**

6 a. Define average and r.m.s values of an alternating current. **(04 Marks)**

b. Define the following:
   i) Fusing current
   ii) Rated current of fuse and
   iii) Fusing factor. **(04 Marks)**

c. Two impedances $z_1 = (150 + j157)$ ohm and $z_2 = (100 - j110)$ ohm are connected in parallel across 220V, 50Hz supply. Find the total current, total power drawn and power factor. **(08 Marks)**

## Module-4

7 a. Obtain relationship between line and phase values of voltage in a three phase balanced star connected system. **(06 Marks)**

b. Derive the E.m.f equation of an alternator. **(06 Marks)**

c. A 3-phase delta connected load consumes a power of 60kW taking a lagging current of 200A at a line voltage of 400V, 50Hz, find the parameters of each phase. **(04 Marks)**

**OR**

8 a. Show that in a three phase star connected balanced circuit two wattmeters are sufficient to measure the total power. Also obtain expression for power factor of the circuit. **(08 Marks)**

b. A 3 phase, 16 pole alternator has star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03wb and the speed is 375rpm. Find the frequency, the phase emf and line emf. Assume pitch factor $k_c = 1$ and distribution factor $k_d = 0.96$. Also determine the output KVA of the alternator. If the total current in phase is 40A. **(08 Marks)**

## Module-5

9 a. Derive emf equation of a transformer. **(04 Marks)**

b. Derive the relation ship between the frequency of the rotor induced emf and the frequency of the supply given to the stator. **(04 Marks)**

c. A 500KVA, transformer has an efficiency of 92% at full load, unity power factor and at half full load, 0.9 power factor. Determine its efficiency at 80% of full load and 0.95 power factor. **(08 Marks)**

**OR**

10 a. Explain the various losses in a transformer and how to minimize them. Give equations for these losses. **(06 Marks)**

b. A 250 KVA, 11000/415V, 50Hz single phase transformer has 80 turns on the secondary. Calculate: i) Maximum value of flux ii) Rated current in primary and secondary. **(04 Marks)**

c. An 8 pole alternator runs at 750 rpm supplies power to 4 pole induction motor. The frequency of rotor is 1.5Hz. What is the speed of the motor? What is the slip? **(06 Marks)**

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