CBCS SCHEME

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2018
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 and explain ohm's law, mention its limitations. **(05 Marks)**

b. Define the coefficient of coupling and find its relation with L_1, L_2 and M. **(05 Marks)**

c. A current of 30A flows through two ammeters A_1 and A_2 connected in series. The potential differences across the two ammeters are 0.3V and 0.6V respectively. Find how the same current will divide when they are connected in parallel. **(06 Marks)**

OR

2 a. Derive an expression for energy stored in the magnetic field. **(05 Marks)**

b. State and explain Kirchhoff's Laws. **(05 Marks)**

c. A coil of 1000 turns is wound on a silicon steel ring having μ_r of 1200. The ring has a mean diameter of 10cm and cross sectional area of 12 Sq.cm. when a current of 4A flows through the coil find :

i) Flux is the core
ii) Inductance of the coil
iii) The e.m.f induced in the coil. If the flux falls to zero in 15ms and
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 with neat sketch the constructional features of a D.C. Generator and mention the function of each part. **(05 Marks)**

b. With the help of neat diagram, explain the construction and working principles of dynamometer type wattmeter. **(05 Marks)**

c. A 4 pole shunt motor takes 22.5 amperes from a 250V supply. $R_a = 0.5\Omega$ and $R_{sh} = 125\Omega$. The armature is wave wound with 300 conductors if the flux per pole is 0.02 wb, calculate :

i) Speed
ii) Torque developed
iii) Power developed. **(06 Marks)**

OR

4 a. Derive an expression for the armature torque developed in a d.c motor. **(05 Marks)**

b. Sketch and explain :

i) Torque – armature current characteristics
ii) Speed – armature current characteristic for a d.c shunt motor. **(05 Marks)**

c. With a neat diagram, explain the working of an induction type of energy meter. **(06 Marks)**

Module-3

5 a. With the help of circuit diagram and phasor diagram, find the phase angle, impedance and power in case of R-L series circuit. **(05 Marks)**

b. With a neat diagram, explain the pipe earthing. **(05 Marks)**

c. A circuit consists of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150μF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, p.f and power consumed by the circuit. Draw the vector diagram. **(06 Marks)**

OR

6 a. Prove that the current in a purely inductive circuit lags behind the applied voltage by 90°. **(05 Marks)**

b. With relevant circuit diagrams and switching table, explain three way controls of Lamps. **(05 Marks)**

c. Two circuits A and B are connected in parallel across 200V, 50Hz supply circuit A consists of 10Ω resistance and 0.12H inductance in series while circuit B consists of 20Ω resistance in series with 40μF capacitor. Calculate :

i) Current in each branch
ii) Supply current
iii) Total power factor. **(06 Marks)**

Module-4

7 a. For a three phase star connection, find the relation between line and phase values of current and voltages. Also derive the equation for the three phase power. **(05 Marks)**

b. Obtain the expression for emf of an alternator and give the significance of the winding factor. **(05 Marks)**

c. Two wattmeter's connected to measure the power in a 3 phase circuit read 5kW and 1kW. The latter being read after reversing the current coil. Calculate the power, power factor, total volt-amperes and reactive volt amperes. **(06 Marks)**

OR

8 a. With necessary sketches distinguish between salient pole and cylindrical pole type synchronous generator. **(05 Marks)**

b. Show that two wattmeter's are sufficient to measure power in 3-phase balanced star connected circuit with neat circuit and phasor diagram. **(05 Marks)**

c. A 6 pole 3 phase, 50Hz alternator 12 slot per pole and 4 conductor per slot. The winding is $\frac{5}{6}$ full pitched. A flux of 25 mwb per pole is sinusoidally distributed along the air gap. Determine the line e.m.f if the alternator is star connected. **(06 Marks)**

Module-5

9 a. Explain the various losses that occur in a transformer. **(05 Marks)**

b. Define slip. Derive an expression for frequency of rotor current. **(05 Marks)**

c. A 10KVA, 400/200V, 50Hz single phase transformer has a full load copper loss of 200W and has a full load efficiency of 96% at 0.8pf lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity p.f? **(06 Marks)**

OR

10 a. Explain the principle of operation of a 3 phase Induction motor and give reason for an induction motor cannot run at synchronous speed. **(05 Marks)**

b. Derive the EMF equation of a transformer. **(05 Marks)**

c. A 4 pole 3 ϕ 50Hz induction motor runs at a speed of 1470 rpm. Find the synchronous speed, the slip and frequency of the induced emf in the rotor under this condition. **(06 Marks)**

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