USN ☐☐☐☐☐☐☐☐☐☐ 15ELE15/25

First/Second Semester B.E. Degree Examination, Aug./Step.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. Define : i) Electric current ii) Potential difference iii) Resistance iv) Self inductance v) Electric power. **(05 Marks)**

   b. For the circuit shown in Fig.Q1(b), find the power dissipated in the 16 ohm resistor.
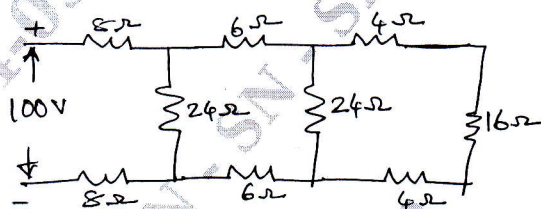

Fig.Q1(b) **(05 Marks)**

   c. Find the inductance of a coil of 200 turns wound on a paper core tube of 25cm length and 5cm radius. Also calculate the energy stored in it if current rises from 0 to 5A. **(06 Marks)**

OR

2 a. Explain self induced emf and mutually inducted emf. Write the expressions for self inductance and mutual inductance. **(05 Marks)**

   b. Two resistors are connected in parallel across a 200V supply and the total current drawn from the supply is 25A. If the power dissipated in one of the resistors is 1500w, what is the resistance of each resistor? **(06 Marks)**

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

Module-2

3 a. With usual notations derive the EMF equation of a DC generator. **(05 Marks)**

   b. With a diagram, explain construction and working of single phase induction type energy meter. **(06 Marks)**

   c. A 4 pole DC shunt motor takes 22A from 220V supply. The armature and field resistances are respectively 0.5Ω and 100Ω respectively and the armature is lap connected with 300 conductors. If the flux/pole is 20 mwb, calculate the speed and gross torque. **(05 Marks)**

OR

4 a. Draw : i) Ta Vs Ia ii) N Vs I_a characteristics of a dc series and shunt motors. Mention their applications. **(06 Marks)**

   b. With a neat diagram, explain construction and principle of operation of dynamometer type wattmeter. **(05 Marks)**

   c. A 4 pole, 220V, lap connected, DC shunt motor has 36 slots, each slot containing 16 conductors, it draws a current of 40A from the supply. $R_a = 0.1\Omega$; $R_{sh} = 110\Omega$, The motor develops an output power of 6kN. The flux/pole is 40 mwb. Calculate :
   i) The speed ii) Armature torque iii) Shaft torque. **(05 Marks)**

Module-3

5 a. Prove that in a purely inductive circuit, the current lags the voltage by $\pi/2$ radius. **(05 Marks)**

   b. Clearly differentiate between fuse and MCB. **(05 Marks)**

   c. A parallel circuit comprise a 20Ω resistor in series with an inductive reactance of 15Ω in one branch and a 30Ω resistor in series with a capacitive reactance of 20Ω in the other branch. Determine the current and power dissipated in each branch if the total current drawn by the circuit is $10\lfloor-30°$ A. **(06 Marks)**

OR

6 a. Define : i) Wave form   ii) Frequency   iii) Amplitude
              iv) Form factor   v) Peak factor. **(05 Marks)**

   b. An AC current is given by c = 10 sin wt + 2 sin wt + 2 sin wt. Find the rms value of the current. **(05 Marks)**

   c. What is the necessity of Earthing? Explain plat Earthing. **(06 Marks)**

Module-4

7 a. What is a polyphase system? List the advantages of the polyphase system over single phase system. **(05 Marks)**

   b. Obtain an expression for the frequency of the induced emf in an alternator. **(05 Marks)**

   c. A balanced 3ph, Y connected load draws power from 440V supply. The two wattmeters connected to measure the input power reads 5KW and 1.2KW respectively, the latter being obtained after reversing the current coil. Calculate : i) Total power   ii) Power factor   iii) Current in the circuit. **(06 Marks)**

OR

8 a. Draw the power triangle for the 3φ load obtain the relationship between phase and line values of current in a 3ph balanced delta connected system. **(06 Marks)**

   b. A 3ph, 6pole, Y connected, AC generator rms at 1000rpm the stator has 90 slots and 8 conductors/slot the flux/pole is 0.05wb. Calculate the generated line voltage if the $K_w = 0.96$. **(05 Marks)**

   c. There coils each of impedance $20\lfloor60°$ Ω are connected in Y across a 3ph, 400V, 50Hz supply. Find the readings on each of the two wattmeters connected to measure the input power. **(05 Marks)**

Module-5

9 a. Explain what happens when a transformer is connected to a DC supply. Compare core type and shell type transformers. **(05 Marks)**

   b. The primary winding of a transformer is connected to a 240V, 50Hz supply. If the maximum value of the flux in the cone is 0.00207Wbs, determine :
      i)   Secondary induced emf
      ii) Number of turns in the primary
      iii) Cross sectional area of the cone if the maximum flux density in the core is 0.465 tesla. **(06 Marks)**

   c. Explain the working principle of 3 phase induction motor. **(05 Marks)**

OR

10 a. A 600KVA transformer has an efficiency of 92% both at full load and half full load, upf. Calculate its efficiency at 75% full load, 0.9pf. **(06 Marks)**

   b. Explain why an induction motor needs starter is the neat sketch, explain star-delta starter for a 3 phase induction motor. **(05 Marks)**

   c. If a 6 pole induction motor supplied from a 3ph, 50Hz supply has a rotor frequency of 2.3Hz, calculate the percentage slip and the speed. **(05 Marks)**