USN | 1 | A | T | 0 | 5 | E | C | | | |

NEW SCHEME

First / Second Semester B.E. Degree Examination, July 2006
Common to All Branches
Basic Electrical Engineering

Time: 3 hrs.] [Max. Marks:100

Note: *1. Answer any FIVE full questions.*

1 a. Define and explain Faraday's laws and Lenz's law. **(08 Marks)**

b. Define an expression for energy stored in a magnetic field. (With usual notations). **(04 Marks)**

c. An air-cored solenoid has length of 50cm and a diameter of 2cm. Calculate its inductance if it has 1000 turns and also find the energy stored in it if the current rises from zero to 5A. **(08 Marks)**

2 a. Derive expressions for the rms value and average value of a sinusoidally varying current. **(06 Marks)**

b. Derive expressions for impedance, phase angle and power in R-L-C series circuit energized by sinusoidal voltage. **(06 Marks)**

c. A coil of power factor 0.6 is in series with a 100 μF capacitor. When connected to a 50 Hz supply, the potential drop across the coil is equal to the potential drop across the capacitor. Find the resistance and inductance of the coil. **(08 Marks)**

3 a. Define: i) Active Power ii) Reactive Power and iii) Apparent Power in ac circuits. Mention their units. **(06 Marks)**

b. Two circuits the impedances of which are given by $Z_1 = (10 + J15)\Omega$ and $Z_2 = (6 - J8)\Omega$, are connected in parallel. If the total current supplied is 15A, what is the power taken by each branch? **(06 Marks)**

c. A resistance of 10Ω, and inductive reactance of 8Ω and capacitive reactance of 15Ω are connected in parallel across 120V, 50Hz mains. Determine:
i) the total current ii) power factor of the circuit and iii) the power. **(08 Marks)**

4 a. Explain with the help of a sketch the construction and working of a single phase energy meter. **(08 Marks)**

b. What is a megger? On what principle does it work? Mention its application. **(06 Marks)**

c. Give a circuit diagram for controlling a lamp from three points. **(06 Marks)**

5 a. Sketch the general arrangements of a dc machine and name the parts. **(06 Marks)**

b. Explain the principle of working of the commutator in a dc machine. **(06 Marks)**

c. The field current in a dc shunt machine is 2A and the line current is 20A at 200V. Calculate:
i) the generated emf when working as generator.
ii) torque in N-m when running at 1500 rpm as motor.
Take the armature resistance as 0.5 ohm. **(08 Marks)**

Contd... 2

6 a. Name three important parts of a dc - 3 point starter and mention their functions. **(06 Marks)**

b. Enumerate the advantages of having stationary armature and rotating field system in large capacity alternators. **(06 Marks)**

c. A 2 pole 3 phase alternator running at 3000 rpm has 42 armature slots with 2 conductors in each slot. Calculate the flux / pole required to generate a line voltage of 2300V. Distribution factor is 0.952 and the pitch factor is 0.956. **(08 Marks)**

7 a. What is a transformer and what are its functions? Mention its application in ac transmission and distribution systems. **(06 Marks)**

b. A 50 kVA transformer has $n_1:n_2=300:20$.The primary winding is connected to a 2200V, 50Hz supply. Calculate:
i) secondary voltage on no load
ii) approximate values of primary and secondary currents on full load
iii) the maximum value of the flux. **(06 Marks)**

c. A transformer working at unity power factor has an efficiency of 90% at both one-half load and at the full load of 500W. Determine the efficiency at 75 percent of full load. **(08 Marks)**

8 a. Explain briefly the concept of rotating magnetic field and its role in the development of torque in the induction motor. **(06 Marks)**

b. Why does an induction motor draw a large current when started direct on line? Justify the statement that Y-Δ starting reduces both line current and torque to one-third of the direct-on-line values. **(08 Marks)**

c. A 6 pole induction motor is supplied by a 10 pole alternator which is driven at 600 rpm. If the motor is running at 970 rpm, determine the percentage slip. **(06 Marks)**

*****