6. (a) Describe the construction, principle of operation and applications of capacitor start induction motor. (7)

(b) The following data pertains a 230 V, 50 Hz, $1-\phi$, capacitor start induction motor at stand still.

Main winding : 100 V; 2 A; 40 W

Auxillary winding : 80 V; 1 A, 50 W

Determine the value of capacitance for obtaining maximum starting torque. (7)

7. (a) Explain why single phase induction motor is not self starting. Also explain various methods of starting. (7)

(b) Explain with neat schematic diagram the principle of operation and construction of AC series motor. (7)

8. (a) Derive an expression for output in KVA in terms of its main dimensions for a 3-phase transformer. (7)

(b) Explain how heat generated in a transformer can be managed. Give a detailed scheme. (7)

[06 – 3113]

III/IV B.E. DEGREE EXAMINATION.

First Semester

Electrical and Electronics Engineering

Elective II – PERFORMANCE AND DESIGN OF ELECTRICAL MACHINES – II

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

First question is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

$(7 \times 2 = 14)$

1. (a) Draw the phasor diagram of a transformer connected with leading load.

   (b) What is the function of conservator tank near the transformer?

   (c) Write the power stages of 3-phase induction motor and list out the losses.

   (d) What are the advantages of two phase motors?

   (e) List out the cooling methods of a transformer.

(f) Draw the torque speed characteristics of shaded pole motor.

(g) Write the applications of universal and hysterisis motors.

2. (a) Derive the condition for maximum efficiency of a single phase transformer. (7)

(b) Two transformers A and B are connected in parallel to supply a load having an impedance of $(2 + j1.5\Omega)$. The equivalent impedances referred to the secondary windings are $0.15 + j\ 0.5\Omega$ and $0.1 + j\ 0.6\ \Omega$ respectively. The open-circuit emf of A is 207V and B is 205 V.

Calculate:

(i) the voltage at the load
(ii) the power supplied to the load
(iii) the power output of each transformer
(iv) KVA input to each transformer. (7)

3. (a) Explain the principle of operation of single phase auto transformer. Derive an expression for the saving of copper in auto-transformer as compared with an equivalent two winding transformer. (7)

(b) In a 25 KVA, 2000 / 200 V transformer, iron and copper losses are 350 W and 450 W required

Calculate the efficiency at UPF at

(i) Half full load
(ii) 3/4 full load.

Determine the load for maximum efficiency. (7)

4. (a) Derive the relation between rotor power input, mechanical power developed and rotor copper loss of a 3-phase induction motor. (7)

(b) A 110V, 3-phase, star connected induction motor takes 25 A at a line voltage of 30 V with rotor blocked. With this line voltage power input to the motor is 440 W and core loss is 40 W. The d.c. resistance between a pair of stator terminals is 0.15 Ω. If the ratio of a.c. to d.c resistance is 1.6, find the equivalent leakage reactance per phase of the motor and the stator and the rotor resistance per phase. (7)

5. (a) Explain the construction, principle of operation and speed control of a Schrage motor. (7)

(b) A 400 volts, 50 Hz, delta connected, 3-phase induction motor gave the following test results. No load test; 400 V, 8.6 A, 1120 W (line value). Blocked rotor test; 130 V, 17.9 A, 1640 W (line values). Stator resistance per phase = 2.45 Ω. Draw the circle diagram and find the parameters; full load current, torque and slip. (7)