Code No: R22024 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April-2018
ELECTRICAL MACHINES - II
(Electronics and Electronics Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Discuss the factors that favour the use of silicon steel for the core of a transformer. Also,explain why it should be laminated. [8M]
   b) A single phase transformer has a core with a cross-sectional area of 150 cm^2. It operates at a maximum flux density of 1.1 Tesla from a 50-Hz supply. Determine the output KVA when connected to a load of 4 ohms impedance. The secondary winding has 66 turns. [7M]

2. a) Draw and explain the phasor diagram of a single phase transformer supplying a leading p.f. load. [5M]
   b) The efficiency at unity power factor of 6600/384 volts 100 KVA 50 Hz single phase transformer is 98% both at full load and at half full load. The power factor on no load is 0.2 and the full load regulation at a lagging power factor of 0.8 is 4 %. Draw the equivalent circuit referred to L.V. side and insert all the values. [10M]

3. a) Discuss the various losses that occur in a transformer and obtain the condition for the efficiency to be a maximum. [5M]
   b) A 20 KVA, 2400/240V two winding step down transformer is connected as an auto transformer with additive polarity. Compute: [10M]
   i. Original current capacity of HV winding
   ii. Original current capacity of LV winding
   iii. KVA rating of auto transformer using current capacity of LV winding as calculated in ii
   iv. per cent increase in KVA capacity of auto transformer as compared to original two winding transformer
   v. percent overload of 2400V winding when used as an auto transformer.

4. a) Explain with a neat circuit diagram, how to obtain 2-phase balanced supply from 3-phase balanced supply using single phase transformers. [8M]
   b) In a Scott connection, calculate the values of line currents on the three-phase side, if the loads on the 2-phase side are 300 KW and 450KW, both at 100V and 0.707 p.f. (lag) and the 3-phase line voltage is 3,300V. The 300KW load is on the leading phase on the 2-phase side. Neglect transformer losses. [7M]

5. a) "A 3-phase induction motor can never operate with a slip equal to zero" – Discuss. [7M]
   b) A 4-pole induction motor is energized from a 50 Hz supply. If the machine runs on full load at 2% slip, determine the [8M]
   i. Rotor speed with respect to resultant rotor field, ii. Stator resultant field speed with respect to rotor structure, and iii. Frequency of rotor currents.
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6. a) Sketch and discuss the typical torque-speed characteristics of an induction motor. [7M]

   b) A 3-phase wound rotor induction motor develops a maximum torque of 4 times the full load torque at slip of 0.20. The per phase rotor resistance is 0.04Ω. The stator resistance and rotational losses are negligible. Calculate the value of external resistance that must be inserted in the rotor circuit in order to minimize torque at starting. [8M]

7. A 400V,3-phase,8-pole,50HZ star connected induction motor gave the following test results. [15M]

   No load test: 400V, 10A, 800 watt

   Blocked rotor test: 160V, 30A, 1920 watt

   Stator and rotor ohmic losses are equal. Calculate the efficiency line current, power factor at full load by drawing circle diagram

8. a) Explain the principle of operation of Induction generator and draw its power flow diagram and speed torque characteristics. [8M]

   b) Explain the pole change method speed control with neat sketch by changing the connection of stator coils of 3-phase Induction motor. [7M]