Code No: NR220205 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
ELECTRO MECHANICS-II
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) "Transformer should not be connected to a DC supply". Explain.
   (b) A single phase transformer with 10 : 1 turns ratio and rated at 50 KVA, 2400/240 volts, 50 Hz is used to step down the voltage of a distribution system. The L.V. side voltage is kept constant at 240 V. Find the value of load impedance on L. V. side so that the transformer will be loaded fully. Find also the maximum flux in the core if L.V. side has 23 turns.

2. (a) Explain various losses and derive the condition for minimum efficiency of a transformer .
   (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.

3. (a) What are the applications of auto transformers?
   (b) A 20 KVA, 2400/240V two winding step down transformer is connected as an auto transformer with additive polarity. Compute:
      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) What are the conditions required for the parallel operation of two transformers.
   (b) Derive the equations for the currents supplied by each transformer when two transformers are operating in parallel with equal voltage ratios.

5. (a) Explain why an induction motor cannot develop torque when running at synchronous speed. Define the slip speed of an induction motor and deduce how the frequency of rotor currents and magnitude of rotor emf are related to slip.
   (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
      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.

6. (a) Compare the construction and principle of an induction motor with that of a transformer.
   (b) An 8-pole, 3 phase, 50Hz induction motor runs at a sped of 710 rpm with an input power of 35Kw. The stator copper loss at this operating condition is 1200W while the rotational losses are 600W. Find
      i. Rotor copper loss.
      ii. Gross torque developed.
      iii. Gross mechanical power developed and
      iv. Net torque and mechanical power output.

7. A 10KW, 415V, 4-pole, 3-phase star connected induction motor gave the following test results.
   No load test: 415V, 8A, 1200 watt
   Blocked rotor test : 200V, 45A, 7000 watt
   Stator and rotor ohmic losses are equal at stand still. Draw circle diagram and find efficiency and speed at half full load.

8. (a) Explain the principle of operation of Induction generator and draw its power flow diagram and speed torque characteristics.
   (b) Explain the pole change method speed control with neat sketch by changing the connection of stator coils of 3-phase Induction motor.

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