Roll No.....

NATIONAL INSTITUTE OF TECHNOLOGY, DELHI

Name of Examination: B. Tech (Mid-Semester)

Branch: Electrical & Electronics Engineering **Semester: V**

Title of Course: Electrical Machines-II **Course Code: EEB301**

Time: 2 Hrs **Maximum Marks: 25**

Note: Attempt all Questions.

Q1. Give to the point answers to following questions:

(i) How core losses are separated out from the rotational losses. **(1 marks)**

(ii) What is synchronous watt in three phase induction motor? **(1 marks)**

(iii) How frequency transformation is carried out in the rotor of three phase induction motor. **(1 marks)**

Q2. (i) Differentiate between three phase transformers and three phase induction motors? **(2 marks)**

(ii) Explain with proper mathematical formulation, why starting current in a three phase induction motor is low when maximum starting torque is developed. **(2 marks)**

Q3. Derive the expressions of the resultant MMF wave for three phase distributed winding supplied by a balanced three phase sinusoidal supply. Also draw appropriate phasor diagram representing the developed magnetic field and comment on the nature of field produced. **(4 marks)**

Q4. Why the starting current in a three-phase induction motor is very high. Explain the operations of star-delta starter and auto-transformer starter and compare with direct online starting. **(4 marks)**

Q5. A 50 kW, 440 V, 50 Hz, 3-phase, 8-pole, delta-connected squirrel-cage induction motor has the following parameters referred to a stator phase:

$r_1 = 0.54\ \Omega$, $r_2' = 0.81\ \Omega$, $x_1 + x_2' = 6.48\ \Omega$, $R_l = 414\ \Omega$, $x_m = 48.6\Omega$

Calculate the machine performance (input current, power, power factor, mechanical output (gross) and torque developed (gross) for the following conditions: (a) as a motor at a slip of 0.025, (b) as a generator at a slip of –0.025 and (c) as a break at a slip of 2.0. **(5 marks)**

Q6. A 3-phase induction motor having a 6-pole, star connected stator winding runs on a 240V, 50 Hz supply. The rotor resistance and standstill reactance are 0.12 ohms and 0.85 ohms per phase respectively. The ratio of stator to rotor turns is 1.8 and winding factor is one. The full-load slip is 4%. Calculate for this load the total developed torque and the horse power. Find also the maximum torque and the speed at maximum toque. Neglect stator impedance. **(5 marks)**

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