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GATE ECE Coaching By IITians GATE CLASSES

Induction Machines Assignment

1) In Induction motor for a fixed speed at constant frequency
   (a) Line current and torque proportional to voltage
   (b) Line current and torque proportional to square of voltage
   (c) Line current is proportional to voltage and torque is proportional to square of voltage
   (d) Line current is constant and torque is proportional to square of voltage
2) A 230 V, 50 Hz, 4 pole single phase induction motor is rotating clockwise (forward) direction at a speed of 1425 rpm. If the rotor resistance at standstill is 7.8 ohm, then the effective rotor resistance in the backward branch of the equivalent circuit will be
   (a) 2 Ohm
   (b) 4 Ohm
   (c) 78 Ohm
   (d) 156 Ohm
3) A 400 V, 50 Hz, 30 hp, three phase induction motor is drawing 50 A current at 0.8 power factor lagging. The stator and rotor copper losses are 1.5 kW and 900 W respectively. The friction and windage losses are 1050 W and the core losses are 1200 W. The air gap power of the motor will be
   (a) 15 kW
   (b) 20 kW
   (c) 25 kW
   (d) 30 KW
4) An 8 pole single phase induction motor is running at 690 rpm. What is its slip wit respect to forward and backward fields respectively?
5) Calculate the reduction in starting current and starting torque when the supply voltage to a cag rotor is 80 % instead of 100 %
   (a) 20 % and 30 %
   (b) 20 % and 36 %
   (c) 10 % and 30 %
   (d) 20 % and 40 %
6) A three phase induction motor has a starting torque of 100% and a maximum torque of 200% of the full load torque. Find the slip at maximum torque.
   (a) 27%
   (b) 29%
   (c) 25%
   (d) 30%

CDQ- A 50 Hz, three phase induction motor designed for voltage V_1 is switched onto 40 Hz supply of voltage V_2

7) Find the ratio of starting torques if $V_2 = 1.5\,V_1$.
   (a) 4.39
   (b) 4.5
   (c) 5
   (d) 3.19
8) Find the ratio of maximum torques if $V_2 = 1.5\,V_1$.
   (a) 3.6
   (b) 3.5
   (c) 3.7
   (d) 3.9
9) Find the ratio of starting currents if $V_2 = 1.5\,V_1$.
   (a) 1.9
   (b) 2.0
   (c) 1.5
   (d) 1
10) A three phase induction motor draws 1000 kVA at p.f of 0.8 lag. A synchronous condenser is connected in parallel to draw an additional 750 kVA at a p.f of 0.6 lead. The p.f of the total load supplied by the mains is
   (a) Unity
   (b) 0.707 lead
   (c) 0.6 lag
   (d) Zero
11) A 4 pole, 50 Hz, three phase induction motor has blocked rotor reactance per phase which is four times the rotor resistance per phase. The speed at which maximum torque develops is
   (a) 1150 rpm
   (b) 1500 rpm
   (c) 1125 rpm
   (d) 1210 rpm

CDQ- A 4 pole, 50 Hz, three phase induction motor delivers a shaft torque of 110 N-m at full load and running at 950 rpm. Calculate

12) Rotor copper losses
   (a) 6.5 kW
   (b) 6.4 kW
   (c) 7 kW
   (d) 6 kW

13) Power input to the rotor
   (a) 1.75 kW
   (b) 1.8 kW
   (c) 1.7 kW
   (d) 1.65 kW
14) 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.
   (a) 6%
   (b) 5%
   (c) 4%
   (d) 3%
15) A 6 pole, 50 Hz, three phase slip ring induction motor has resistance and reactance of 0.5 Ohm and 5 Ohm per phase respectively. Calculate the value of external resistance to be inserted such that starting torque is half of the maximum torque.
   (a) 0.84 Ohm
   (b) 0.8 Ohm
   (c) 0.9 Ohm
   (d) 0.94 ohm

   CDQ- The power input to a 6 pole, 50 Hz, three phase induction motor is 700 W at no-load and 10 kW at full load. The no-load copper losses may be assumed negligible while the full-load stator and rotor copper losses are 295 W and 310 W respectively. Assume rotational and copper losses to be equal.
16) Find the full load speed
   (a) 850 rpm
   (b) 900 rpm
   (c) 967 rpm
   (d) 1134 rpm
17) Find the shaft torque
   (a) 80 Nm
   (b) 85 Nm
   (c) 90 Nm
   (d) 95 Nm
18) Find the efficiency of the motor
   (a) 87%
   (b) 90%
   (c) 93%
   (d) 84%