Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**

PEL3I103

3rd Semester Regular / Back Examination 2018-19

ELECTRICAL MACHINES – I

BRANCH : EEE

Time : 3 Hours

Max Marks: 100

Q.CODE : E935

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part- I

Q1 Short Answer Type Questions (Answer All-10) **(2 x 10)**

a) Why shell type three phase transformer is preferred than core type transformer.

b) A 200 kVA transformer has iron loss of 1kW and full Cu-loss of 2 kW. What is its load kVA corresponding to maximum efficiency?

c) The delta-delta connection of three phase transformer requires more expensive insulation. Why?

d) What are the conditions for an ideal transformer?

e) An auto transformer with transformation ratio of 0.8 supplies a load of 3 kW. What is the power transferred conductively from primary to secondary?

f) Distinguish between the excitation current, the core-loss current, and the Magnetizing current.

g) The no load current of an induction motor is large as compared to transformer of same rating. Justify.

h) A 208-V, 60-Hz, 4-pole, three-phase induction motor has a full-load speed of 1755 rpm. Calculate (a) its synchronous speed, (b) the slip, and (c) the rotor frequency.

i) What happens to the speed of an induction motor if the load is increased?

j) Explain why an induction motor cannot operate at its synchronous speed.

Part- II

Q2 Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) **(6 x 8)**

a) Draw and explain the approximate equivalent circuit of a two winding transformer as viewed from primary side.

b) Derive the condition for getting the maximum efficiency of a transformer.

c) Find the relationship between the phase and line voltages of primary and secondary sides of various groups of three phase transformer connections.

d) Draw the connection diagram of theScott-T connection that usestwo transformers to convert three-phase power to two-phase power. Draw the phasor diagram for this.

e) A 2,200/200 V transformer draws a no-load primary current absorbs 400 watts. Find the magnetizing currents. If the transformer draws 0.5 A at a power factor of 0.3 in an open circuit, find magnetizing and working components of no-load primary current.

f) Write down the conditions for parallel operation of transformer.

g) Write down the stator voltage control of three phase induction motor. Draw the toque-speed characteristic for this of a variable load.

h) Define double field revolving theory of a single phase induction motor. Draw the torque-speed characteristics for both forward and backward flux speed.

i) In a 25kVA,2000/200V, single phase transformer, the iron and full load copper losses are 350 and 450W respectively. Calculate the efficiency at unity power factor on (i) full load (ii) half full load.

j) Derive the relation between the rotor torque and breakdown torque of three phase induction motor.

k) Discuss the construction and principle of operation of single phase transformer.

l) An 8-pole, 50-Hz, 3-phase induction motor has effective rotor resistance of $0.8\,\Omega$ /phase. Stalling speed is 650 r.p.m. How much resistance must be inserted in the rotor phase to obtain maximum torque at starting? Ignore the magnetizing current and stator leakage impedance.

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Draw the phasor diagram of single phase transformer at no load and on load (lagging p.f.) conditions. **(16)**

A 150 kVA transformer is loaded as follows:

Load increases from zero to 100kVA in 3 hours from 7 a.m. to 10 a.m., stays at 100 kVA from 10 a.m. to 6 p.m. and then the transformer is disconnected till next day. Assuming the load to be resistive and core-loss equal to full-load copper loss of 1kW, determine the all-day efficiency and the ordinary efficiency of the transformer.

Q4 Draw and explain the torque-slip characteristics of three phase induction motor at different rotor resistances. **(16)**

The rotor impedance at standstill of a three-phase, Y-connected, 208-V, 60-Hz, 8-pole, wound-rotor induction motor is $0.1+j0.5\Omega$/phase. Determine the breakdown slip, the breakdown torque, and the power developed by the motor. What is the starting torque of this motor? Determine the resistance that must be inserted in series with the rotor circuit so that the starting torque is 50% of the maximum torque.

Q5 Explain the procedures for blocked rotor test and no load test andfind parameters of the induction motor showing the approximate equivalent circuit. **(16)**

Q6 Why the no-load current is more in induction motor in comparison to transformer of same rating during starting. **(16)**

Draw and explain the exact equivalent circuit to show the stator, rotor and load resistance of a three phase induction motor.

A 10-hp, 4-pole, 440-V, 60-Hz, Y-connected, three-phase induction motor runs at 1725 rpm on full load. The stator copper loss is 212 W, and the rotational loss is 340 W. Determine (a) the power developed, (b)the air gap power, (c) the rotor copper loss, (d) the total power input, and (e) the efficiency of the motor. What is the shaft torque?