3rd Semester Back Examination 2019-20
ELECTRICAL MACHINES - I
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : HB893
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	**Only Short Answer Type Questions (Answer All-10)**	(2 x 10)
a)	What will happen if the primary of the transformer is connected to dc supply?	
b)	Why do we use iron-core in a transformer?	
c)	Why are autotransformers not safe for supplying a low-voltage from high voltage source?	
d)	What are the advantages and disadvantages of 3-phase transformer over 3 single-phase bank of transformer?	
e)	In an open delta transformer bank, the load power factor is 0.803. What are the individual power factors?	
f)	What do you mean by synchronous speed of a 3-phase induction motor?	
g)	Why does rotor of a 3-phase induction motor rotate in the same direction as the rotating field?	
h)	What is the difference between squirrel cage rotor and wound rotor of an induction motor?	
i)	How is magnetizing current kept small in a 3-phase induction motor?	
j)	What is the function of a centrifugal switch in a single phase induction motor?	

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	(6 x 8)
a)	Draw the circuit diagram and phasor diagram of the ideal transformer and practical transformer having no load and load condition. Write the meaning of the parameters.	
b)	A 230V/2300V transformer takes a no load current of 6.5A and absorbs 187 W. If the resistance of the primary is 0.06Ω, find (i) the core loss (ii) no load p.f. (iii) active component of current and (iv) magnetizing current.	
c)	What are the conditions for satisfactory parallel operation of single phase transformers ? Explain with circuit digram.	
d)	Explain with neat sketch diagram the determination of parameters using back-to-back test.	
e)	Explain and derive the saving of copper in autotransformer.	
f)	Draw and explain the equivalent circuit of a 3-phase induction motor with phasor diagram.	
g)	Explain the double field revolving theory of single phase induction machine.	
h)	A 600W , 115 V, 50 Hz capacitor start motor draws 13.8 A from the supply at rated load. If the efficiency is 65% and rated speed is 1750 rpm, calculate (i) input power at rated load (ii) power factor at rated load (iii) rated motor horse power.	
i)	Explain and draw the phasor diagram of SCOTT OR T-T Connection of two single-phase transformers.	

j) A 4-pole, 3-phase, 50 Hz induction motor has a star-connected rotor. The rotor has a resistance of 0.1 Ω / phase and standstill reactance of 2 Ω / phase. The induced emf between the slip ring is 100 V. If the full load speed is 1460 rpm, calculate (i) the slip (ii) the emf induced in the rotor in each phase (iii) the rotor reactance per phase (iv) the rotor current and (v) rotor power factor. Assume slip rings are short circuited.

k) Two single phase 150 kVA, 7200 V/600V transformers are connected in open-delta. Calculate the maximum 3-phase load they can carry.

l) An 8-pole, 50 Hz, 3-phase, slip-ring motor has an effective rotor resistance of 0.07 Ω / phase. It's rotor is rotating at a speed of 630 rpm. How much resistance must be inserted per phase to obtain the maximum torque at starting ? Ignore the magnetizing current and the stator leakage impedance.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Draw the connection diagram and phasor diagram of various vector groups of three-phase transformer. A 3-phase, 50 Hz transformer has a delta-connected primary and star-connected secondary, the line voltage being 22000 V and 400 V respectively. The secondary has a star connected balanced load at 0.8 pf lagging. The line current on the primary side is 5A. Determine the current in each coil of the primary and in each secondary line. What is the output of the transformer in kW ? **(16)**

Q4 Explain the no-load test and impedance test of a single phase transformer with neat sketch circuit diagram. An auto-transformer supplies a load of 5 kW at 125 V at unity power factor. If the primary voltage is 250 V, determine (i) transformation ratio (ii) secondary current (iii) primary current (iv) number of secondary turns if total number of turns is 250 (v) power transformed inductively (vi) power transformed conductively. **(16)**

Q5 Explain the various methods of starting and speed control of three phase induction motor. **(16)**

Q6 a) Explain the no-load and blocked rotor test of a three phase induction motor. **(8)**

b) A 4-pole, 3-phase, 50 Hz, slip-ring induction motor rotates at 1400 rpm with slip-ring terminals short-circuited. The rotor resistance is 0.1 Ω/phase and standstill reactance / phase is 0.6 Ω. If an external resistance of 0.1 Ω/phase is added to the rotor circuit, what will be the new full-load speed? **(8)**