Ref. No: EX/IEBE/PE/T/223/2018

B. E. Instrumentation and Electronics Engg. 2nd Year, 2nd Semester Examination-2018

ELECTRICAL MACHINES-II

Time: Three hours **Full Marks: 100**

Question Number		Marks
	Unit-I **(Answer any *two*; Marks: 20)** **(Q1-Q3 must be answered consecutively)**	
1.	a) Describe the construction of SRIM and SQIM and differentiate between them.	5
	b) Why synchronous machine is called doubly excited machine? What is the function of damper bar?	2+3
2.	Show graphically that a rotating magnetic field is produced when balanced poly-phase currents flow in balanced poly-phase windings in IM.	10
3.	What are the various excitation systems in synchronous machine? Briefly describe the brushless excitation system.	4+6
	Unit-II **(Answer any *two*; Marks: 20)** **(Q4-Q6 must be answered consecutively)**	
4.	Draw and explain the external characteristic of a synchronous generator under different load conditions.	10
5.	Describe the slip test method for the measurement of X_d and X_q of synchronous machines.	10
6.	Why do we perform no-load test and blocked rotor test on induction motor? Describe how we can find circuit parameters from these two tests.	2+8
	Unit-III **(Answer any *three*; Marks: 30)** **(Q7-Q11 must be answered consecutively)**	
7.	Develop the equivalent circuit for a poly-phase induction motor at load of slip s. How does it differ from the equivalent circuit of a transformer on loaded condition?	8+2
8.	Develop and describe the three mode operation of IM.	10
9.	What are the different methods of speed control of IM? Explain why VVVF method is preferred over other methods of speed control?	4+6
10.	Explain the Zero power factor or Potier method of voltage regulation of cylindrical rotor	

	Synchronous generator.	10
11.	Derive the expressions for synchronizing power and synchronizing torque of salient pole synchronous generator.	10
	Unit-IV **(Answer any *three*; Marks: 30)** **(Q12-Q16 must be answered consecutively)**	
12.	A 10 kW, 400V, 3-ph, 4 pole delta connected induction motor is running at no load with a line current of 8A and input power of 660W. At full load, the line current is 18A and the input power is 11.20kW. Stator effective resistance per phase is 1.2 ohm and friction and windage loss is 420W. For negligible rotor ohmic losses at no load, calculate: i) stator core loss ii) total rotor losses at full load iii) total rotor ohmic losses at full load iv) full load speed v) internal torque, shaft torque and motor efficiency.	10
13.	The rotor resistance of an 8-pole, 50Hz SRIM has a resistance of 0.5 ohm per phase. The speed of motor is 720 rpm at full load. Determine the external resistance to be connected with the rotor circuit to reduce the speed to 680 rpm for full load torque	10
14.	A squirrel cage induction motor has a slip of 4% at full load. Its starting current is five times the full load current. The stator impedance and magnetizing current may be neglected; the rotor resistance is assumed constant. A) calculate the maximum torque and the slip at which it occurs. B) calculate the starting torque.	10
15.	A 100kVA, three-phase, star-connected alternator has a rated line to line voltage of 1100V. The resistance and synchronous reactance per phase are 0.5 ohm and 6 ohm respectively. Determine the voltage regulation at full load and 0.85 power factor lagging.	10
16.	A 2000 kVA, star connected, 2500V, three phase salient pole synchronous generator has X_d=2 ohm and X_q=1.2 ohm per phase. Neglecting losses, determine the excitation voltage of rated kVA operation and at 0.8 power factor lagging.	10