

APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

7211A_D16_1

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Name

Reg. No:



THIRD SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER
2016

Branch: Electrical Engineering

Specialization: Power Electronics

08EE 7211(A) SPECIAL ELECTRICAL MACHINES AND DRIVES

Time:3 hours

Max.marks: 60

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q.no.	Module 1	Marks
1.a	Describe principle of operation of a single phase stepper motor.	3
Answer b or c		
b	i) Explain principle of operation of a stepper motor with one phase on mode of excitation. ii) A stepper motor has a step angle of 1.8° . Find a) resolution, (b) number of steps required for 50 revolutions and (c) shaft speed if the stepping frequency is 5000 pulse/sec.	6
c	i) A three phase VR stepping motor has a total phase winding resistance of 1Ω and an average phase inductance of 40 mH. The rated phase current is 2 A. Design a simple unipolar drive circuit to give electrical time constants of 2 ms at phase turn-on and 1 ms at turn-off. ii) Explain the open loop control of a stepper motor .	6
Q.no.	Module 2	Marks
2.a	Draw and explain the torque –speed characteristics of a switched reluctance motor.	3
Answer b or c		
b	Explain with neat diagram i) Variable dc link converter ii) C-dump converter.	6
c	i) What is the step angle of a three phase switched reluctance motor having 12 stator poles and 8 rotor poles? What is the commutation frequency in each phase at a speed of 6000 r.p.m? ii) What are the merits and demerits of a switched reluctance motor?	6

Q.no.	Module 3	Marks
3.a	Compare synchronous reluctance motor with a switched reluctance motor.	3
Answer b or c		
b	Explain the principle of operation of a synchronous reluctance motor with suitable phasor diagrams.	6
c	Describe the constructional features of axial and radial flux synchronous reluctance motor.	6
Q.no.	Module 4	Marks
4.a	Describe the constructional features of a BLDC motor.	3
Answer b or c		
b	Describe the working of BLDC motor with 180° magnetic arc with suitable diagrams.	6
c	Explain the technique of detecting rotor position of BLDC motor using optical sensors.	6
Q.no.	Module 5	Marks
5.a	Explain soft chopping mode of speed control of a BLDC motor with suitable diagram.	4
Answer b or c		
b	Explain sensorless control of a BLDC motor.	8
c	Explain different modes of PWM control of a BLDC motor.	8
Q.no.	Module 6	Marks
6.a	Describe the phasor diagram of a PMSM.	4
Answer b or c		
b	i) Describe the self control mode of operation of a PMSM ii) Differentiate between PMSM and DC motor.	8
c	Derive the torque and input power equation of a PMSM through suitable transformations.	8