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

Total Number of Pages: 02 **M.TECH**

P1EEBC03,P1ELBC03,P1IPBC03

1st Semester Regular Examination 2016-17
POWER CONVERSION DEVICES AND DRIVES

BRANCH: EPS,EE,PET,PE,PSE,PS,ESE,PEET,PEPS,PEES,PEE,IPCT(PT),EEE

Time: 3 Hours

Max Marks: 100

Q.CODE:Y950

Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: ***Short answer type*** **(2 x 10)**

a) What is damper winding and why it is used in synchronous machine ?

b) Draw the basic diagram for Kron's primitive machine with two pole ?

c) Which coils are called "Pseudo stationary " ? Explain with example ?

d) Power input to 3 phase induction motor is 50kW.If the stator copper loss is 1kW What is the rotor copper loss if motor is running with a slip of 4% ?

e) What is the minimum value of firing angle above which the output current supplied to a purely resistive load fed from a three phase half wave controlled rectifier becomes discontinuous?

f) What are the advantages of circulating current mode dual converter over non-circulating current mode dual converter?

g) What is four quadrant dc-dc converter? Give its circuit diagram.

h) Derive the steady state stability criteria for electric drive.

i) Discuss the criteria of matching between the motor and power electronic converter.

j) What is the difference between static Kramer dive and static Scherbius drive?

Q2 **a)** Deduce Park's Transformation relating to 3 phase currents of a synchronous machine to its corresponding d-q axis currents ? **(10)**

b) A 11 kV ,3 phase star connected synchronous motor draws a current of 45 A .The effective resistance and synchronous reactance per phase are 0.9Ω and 28Ω respectively. Calculate the power supplied to motor and the induced e.m.f for a power factor of 0.8(lag) ? **(10)**

Q3 **a)** Derive the expression for Synchronous Inductance (L_s) in terms of space fundamental component and leakage inductance for 3 phase cylindrical rotor machine ? **(10)**

b) Explain the complete torque speed characteristic of 3 phase induction motor ? **(10)**

Q4 **a)** The following data referred to a 10 pole ,400 V ,50Hz 3 phase Induction **(10)**

motor R1=1.75 Ω ,X1=5.5 Ω R2'(Rotor resistance referred to stator) =2.25 Ω , X2'(Rotor stand still reactance referred to stator) = 6.6 Ω When the motor is tested on no load it takes 3.8 A (Line Current) and the total core loss is 310W.Use approximate equivalent circuit at 4% slip ,Calculate a) Rotor Current referred to stator b) Mechanical Power developed ?

b) Explain the working of a three phase ac voltage regulator with relevant circuit diagram and wave forms. Give one of its important application. **(10)**

Q5 **a)** Derive the expression for the average and rms output voltage of a three phase semi-converter. Also draw the waveform of voltage across any SCR of the three phase semi-converter. **(10)**

b) A single phase full wave controlled rectifier feeds R-L load with R= 10 Ω and L= 50 mH .The ideal sinusoidal voltage supplied is $v_s=240\sqrt{2}\ Sin\omega t$ at 50 Hz **(10)**

Calculate the average and rms load currents, the power dissipation and the power factor at the supply terminals, if the thyristor firing angle $\alpha=45^o$

Q6 **a)** Describe the soft starting of induction motor with suitable diagram & discuss the disadvantage of Stator voltage control scheme. Explain the impact of non-sinusoidal excitation on induction motor. **(10)**

b) Discuss variable frequency control of induction motor drive. Explain the closed loop control of variable frequency PWM-VSI fed Induction Motor drive with suitable diagram and give a comparison between Squre wave VSI and PWM-VSI drive. **(10)**

Q7 **a)** What is slip power recovery scheme? Explain Static Kramer drive with neat circuit diagram and derive the electromagnetic torque produced under this scheme. **(10)**

b) A 400V, 50Hz, 970 rpm,6 pole, Y-connected wound rotor induction motor has following parameters referred to stator, Rs=0.1Ω, $R_r^{/}$=0.08 Ω, Xs=0.3Ω, $X_r^{/}$=0.4Ω. Stator to rotor turns ratio n=2. Motor speed is controlled by static Kramer drive. The drive is designed for a speed range of 25% below synchronous speed. Maximum value of firing angle is 165^0 and resistance of DC link inductor is 0.01Ω. Calculate (i) Transformer turns ratio (ii) Torque for a speed of 780 rpm and firing angle of 140^0. (iii) firing angle for half the rated torque and speed of 800 rpm **(10)**