Total No. of Questions : 8]

SEAT No. :

P3093

[Total No. of Pages : 3

[5354]-583
B.E. (Electronics)
ADVANCED POWER ELECTRONICS
(2012 Pattern) (Theory)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume Suitable data if necessary.***

Q1) a) Explain in detail with waveforms the effect of source impedance on performance of LCC. **[6]**

b) Explain following power factor improvement (any one) techniques for single phase converters with suitable waveforms and equations

i) Extinction Angle Control (EAC)

ii) Symmetrical Angle Control (SAC)

iii) Pulse Width Modulation Control (PWM)

[7]

c) The input voltage of a cycloconverter is 120 V (rms) 60 Hz. The load resistance is 5Ω and the load inductance is Lis 40mH. The frequency of the output voltage is 20 Hz. If the converters are operated as semi converters such that $0 \leq \alpha \leq \pi$ and the delay angle is $\alpha_p = 2\pi/3$. Calculate **[7]**

i) The rms value of the output voltage Vo

ii) The rms current of each of the thyristor Ig and the input power factor (PF).

P.T.O.

OR

Q2) a) Compare Circulating and non-Circulating current type dual converters. **[6]**

b) A 3 phase dual converter is operated from a delta star connected transformer of 220 Volts, 50Hz supply, If the load resistance is 10Ω, the circulating inductance is 7.5mH and $\alpha_1 = 50°$, Calculate Peak circulating current and current of converter - I **[7]**

c) With the help of neat circuit diagram and waveforms explain the operation of single phase bridge Diode Clamped Multilevel inverter. State its features, advantages and disadvantages. **[7]**

Q3) What is braking? Explain Regenerative braking of DC machine. Mention its advantages and disadvantages. **[6]**

a) A 15 HP 220 V, 2000 rpm separately excited DC motor controls load requiring a torque $T_L = 45$ N-m at a speed of 1200 rpm. Field resistance Rf = 147 Ω, armature resistance Ra = 0.25 Ω and the voltage constant of the motor is $K_v = 0.7302$ V/A-rad/S. The field voltage is 220V. The viscous friction and no load losses are negligible. Armature current can be assumed to be continuous and ripple free. Calculate back emf Eg, required armature voltage Ea and the rated armature current of the motor. **[6]**

b) Calculate transfer function block diagram of DC motor. **[4]**

OR

Q4) a) Explain and draw the curve torque and power versus speed separately excited dc motor. **[6]**

b) Draw and explain the power circuit of single phase semi-converter feeding a separately excited DC motor. Explain with typical waveforms, the operation in continuous and discontinuous armature current modes. **[6]**

c) Compare converter fed and chopper fed drive. **[4]**

Q5) a) Explain variable square wave VSI Drives along with block diagram and application. **[8]**

b) What is the need of vector control in Induction Motors? Briefly explain Vector control of induction motors. **[10]**

OR

Q6) a) Compare various speed control techniques of Induction motor on the basis of performance parameters. **[8]**

b) With the help of suitable circuit diagram and waveforms explain the working of Variable frequency PWM VSI Drives. **[10]**

Q7) a) Compare variable reluctance motor with permanent magnet stepper motor. **[8]**

b) Explain block diagram of volts/hertz control of synchronous motor drive along with the torque slip characteristics and the applications. **[8]**

OR

Q8) a) Explain with a diagram the construction, working and typical applications of Universal motor. **[8]**

b) Explain the operation of a switched reluctance motor drive. **[8]**

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