* S F - 8 3 3 9 / 3 0 0 *

SF-8339

B. E. - III (Sem. VI) (Electrical) Examination

May / June - 2011

Power Electronics - II

(New Course)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 3 (SEM. 6) (ELECTRICAL)

Name of the Subject :

☛ POWER ELECTRONICS - 2 (NEW)

☛ Subject Code No. : 8 3 3 9 ☛ Section No. (1, 2,.....) : NIL

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Figures to the right indicate full marks.

(4) Make suitable assumptions, whenever necessary.

1 (a) Fill in the blanks : **5**

(i) _____ is the measure of harmonic content in the output voltage of inverter. (EMI, THD)

(ii) MOSFET is _____ controlled device. (Current, Voltage)

(iii) Speed of slip ring induction motor can be controlled_____ the base speed of the motor by extracting power from its rotor. (above, below)

(iv) In _____ mode of operation of inverter switching losses are higher compare to _____ mode of operation of inverter. (180^o, 120^o)

(v) _____ inverters are cheaper than _____ inverters.(Transistorized, Thyristorized)

(b) Answer the following in one or two sentences. **5**

(i) State the effects of harmonic on the performance of induction motor.

(ii) Name two modes of operation of induction motor.

(iii) Why protection against shoot-through is not needed in CSI ?

(iv) Which power devices are preferred in the inverter ?

(v) Which mode of inverter operation is having higher output voltage ?

(c) Explain 120^{o} mode of operation of 3-ϕ inverter with waveforms of all phase voltages, line voltages and phase currents for delta connected load. **10**

2 (a) For a 3-ϕ bridge inverter (180^{o} mode) feeding a star connected purely resistive load.

Express line voltages Vab, Vbc, Vca in Fourier series form. **5**

Find rms value of fundamental component of line voltage. **2**

Find rms value of first three non-zero harmonic components of the line voltage. **3**

Name that dc supply voltage to be equal to V volts.

(b) Explain v/f control of 3-ϕ induction motor. **5**

OR

2 (a) Explain use of CSI for speed control of Induction Motor. **7**

(b) For harmonic reduction in single-phase inverters, two identical transformers are used in series. Write the furrier series for individual inverter output. **4**

Also derive the expression of net output voltage of their series connection. **2**

What should be the phase shift between output voltage waveforms of two inverters to eliminate fifth harmonic from the net output voltage of series connection. **2**

3 Attempt any three : 15

(i) Explain harmonic reduction in inverter output using transformer connection.

(ii) Draw the following waveforms for single phase half bridge voltage source inverter for RL load.

(a) Gate pulses

(b) Supply voltage

(c) Output voltage

(d) Output current

Show the device conduction also.

(iii) Compare square wave inverter and PWM interver.

(iv) Write short notes on effects of harmonics on motor drives.

(v) Explain space vector pulse width modulation technique.

4 (a) Answer the following in one or two sentences. 10

(i) State the types of shunt compensators.

(ii) Give the difference between ON-OFF control and phase control of ac voltage controller.

(iii) What is cyclo-converter ?

(iv) What are the advantages of unidirectional ac voltage controller ?

(v) What are the disadvantages of continuous gating signal ?

(b) Answer the following : 10

(i) Explain the concept of resistance welding.

(ii) Write short note on : TRIAC as a static switch.

5 (a) Explain single-phase unidirectional ac voltage controller with R-load. 7

(b) A single phase full wave ac voltage controller has resistive load of $R=5\,\Omega$ and input voltage is Vs=120 V, 50 Hz. The delay angles of thyristor T_1 and T_2 are equal: $\alpha_1 = \alpha_2 = 2\pi/3$. Determine (a) the rms output voltage (b) the input power factor (c) the average current of thyristor (d) rms current of thyristor. 8

OR

5 (a) Explain operation of 3ϕ to 1-ϕ cyclo converter with circuit diagram and waveforms. **7**

(b) An ac voltage controller has resistive load of R = 5Ω and input voltage (rms) is Vs=120 V, 50 Hz. The thyristor is on for 20 cycles and is off for 70 cycles. Determine (a) the rms output voltage(b) the input power factor (c) the average current of thyristor (d) rms current of thyristor. **8**

6 Attempt any three : **15**

(i) Write short note on AC voltage controller with PWM control.

(ii) Compare HVDC and HVAC systems.

(iii) Explain principle of induction heating with block diagram.

(iv) Write short note on : Electronic Ballast.
