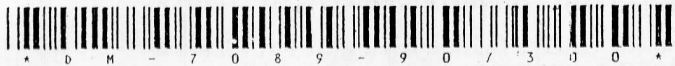DM-7089-90

B. E. III (Sem. VI) (ECC) Examination

January – 2008

Industrial Electronics

Time : 3 Hours]   [Total Marks : 100

DM-7089

Instructions :

(1)

(2) Attempt all questions.

(3) Assume suitable data if necessary.

(4) Figures to the right indicate full marks.

(5) Use scientific calculator Casio FX 82/83 or equivalent.

1 (a) Answer the following :   10

     (i) Snubber Circuit is used for dv/dt and di/dt protection of SCR (State True/False).

[handwritten: dv/dt Protection]

     (ii) During overlap angle (μ) in three phase full converter, at a time _____ SCRs conduct.

     (iii) The average O/P voltage is zero in three phase full converter with RL load for a fing angle equal to _____ *[handwritten: $\alpha = 90°$]*

[handwritten margin: $V_0 = \dfrac{3 V_m \cos\alpha}{\pi}$ $\alpha = 90°$]

     (iv) Dual converter is ___4___ quadrant converter.

     (v) In resistance triggering the maximum firing angle is __90°__ degree.

[handwritten margin: R   0 — 90°   RC   0 — 180°   half wave]

     (vi) The value of η, instrinsic stand-off ratio is between __0.51__ to __0.82__.

     (vii) The angle between the instant thyristor would conduct from zero is called __firing angle__.

     (viii) Semiconverter can be a two quadrant converter with RL load. (True or False)

     (ix) The controlled rectifer with free wheeling diode improves the power factor. (State True/False)

     (x) The average O/P voltage in single phase half wave circuit is given by __$V_0 = \dfrac{V_m}{2\pi}(1+\cos\alpha)$__

(b) (i) Explain comparison of MOSFET and BJT. 5

(ii) For single phase full converter, derive the expression 5

$$\cos(\alpha+\mu)=\cos\alpha-\frac{wL_s \cdot I_0}{V_m}$$

where α = Firing angle and μ = overlap angle

L_s = Source inductance, I_0 = Average load current.

2 (a) Compare a UJT firing circuit with R and RC firing circuit. 7

(b) Classify different methods of commutations for thyristor. Explain each in brief. 8

OR

2 (a) A thyristor controlling the power in a load resistance R_L. The supply voltage is 240 V dc and the specified limits for di/dt and dv/dt. For the SCR are 50 A/μsec and 300 V/μsec respectively. Determine the values of the di/dt inductance and the snubber circuit parameters R_s and C_s. 7

(b) Explain the following terms with respect to SCR : 6
(i) Turn ON time
(ii) Holding current
(iii) Latching current

(c) Explain dv/dt protection of thyristor. 2

3 (a) Draw the waveform for single phase full converter with RLE load for value of extinction angle $\beta < \pi$ and $\pi < \beta < \pi < \pi + \alpha$. Draw waveform for load current, output voltage, supply current. Assume discontinuous conduction. 6

(b) A single-phase full converter bridge is connected to RLE load. The source voltage is 230V, 50Hz. The average load current of 10 A is continuous over the working range. For R=0.4 Ω and L = 2 mH, compute : 9
(i) Firing angle delay for E = 120 V.
(ii) Firing angle delay for E = –120 V.
Indicate which source is delivering power to load in part (i) and (ii). Sketch the time variation of output voltage and load current for both the parts.

OR

(a) Explain the operation of three phase full converter with RLE load. Draw the waveform for the output voltage for firing angle α =60° and α =90°. 10

(b) Explain single phase dual converter. Also discuss the practical dual converter. Draw the necessary waveforms. 5

DM-7090

Instructions :

(1)

(2)   Attempt all questions.

(3)   Assume suitable data if necessary.

(4)   Figures to the right indicate full marks.

(5)   Use scientific calculator Casio FX 82/83 or equivalent.

4   (a)   (i)   In dc chopper, per unit ripple is maximum when   **10**
              duty cycle α is [$\alpha = 0.5$]. [$\alpha = 50\%$]

        (ii)   In sinusoidal pulse width modulation, the width of
              different pulses are not the same. (True or False).

        (iii) In step up chopper the O/P voltage V_0 is given by
              in terms of duty cycle α and input voltage V_s,
              $V_0 = V_s \dfrac{1}{1-\alpha}$.

        (iv)   In frequency modulation method of controlling the
              average output voltage in a chopper, the chopping
              period is _____ but on time is _____ or
              off time is _____.

        (v)   In modified Mc-Murray-bedford inverter circuit,
              the energy trapped in inductor can be returned
              to the source. State True/False.

        (vi)   In single pulse width modulation the frequency of
              control signal controls the frequency of output.
              (State True/False).

        (vii) Give example of device in which VSI inverter is used.

        (viii) In 120° mode of operation of a 3-phase bridge
              inverter, _____ thyristors conduct at any
              instant.

        (ix)   In 180° mode of operation a 3-phase bridge
              inverter each thyristor conducts for _____
              degree in each cycle.

        (x)   Two quadrant type B chopper operates in 1st
              and 4th quandrants.
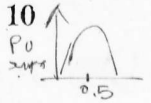
3-φ bridge inverter

(b) Explain stator voltage and frequency control of Induction motor.   10

5   (a) Explain step up chopper with waveform. ✓   10

   (b) A step up chopper has input voltage of 220 V and output   5
voltage of 660 V. If the non-conducting time of thyristor
is 100 μs, compute the pulse width of output voltage.

OR

(a) Explain steady state time-domain analysis of type A   10
chopper.

(b) Explain load commutated chopper.   5

6   (a) Explain 120° mode of operation of three phase inverter.   10

   (b) Discuss the external control of inverter.   5

OR

(a) Explain how the PWM technique is used to reduce the   10
harmonics.

(b) Explain half bridge and full bridge inverter circuit   5
with waveform.