



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2007

POWER ELECTRONICS**SEMESTER - 5**

Time : 3 Hours]

[Full Marks : 70

GROUP - A**(Multiple Choice Type Questions)**1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) When a UJT is used for triggering an SCR, the waveshape of the voltage obtained from UJT circuit is a

- | | |
|---------------------|------------------|
| a) sine wave | b) sawtooth wave |
| c) trapezoidal wave | d) square wave. |

ii) If gate current increases then forward break-over voltage will

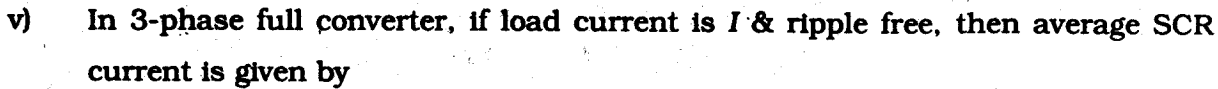
- | | |
|----------------|-------------------|
| a) increase | b) decrease |
| c) remain same | d) none of these. |

iii) A 1-phase full bridge VSI has inductor L as load. For a constant voltage source, the current through the inductor is

- | | |
|----------------|--------------------|
| a) square wave | b) triangular wave |
| c) sine wave | d) pulse wave. |

iv) A centre tapped type single phase diode rectifier circuit is fed from a 230 V, 50 Hz source. The transformer has a voltage rating of 230 V / 50 V-0-50 V. The peak reverse voltage across the diodes is

- | | |
|--------------------|----------|
| a) $100\sqrt{2}$ V | b) 100 V |
| c) $50\sqrt{2}$ V | d) 50 V. |



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- 10-10-10

$$3 \times 5 = 15$$

- 3 + 2**

**GROUP - C****(Long Answer Type Questions)**

Answer any three questions.

3 × 15 = 45

7. a) Describe the working of a single phase full converter in the rectifier mode with RLE load. Illustrate your answer with waveforms for source voltage, output voltage, output current, current through and voltage across one SCR. Assume continuous conduction.

- b) A 3-phase full converter is connected to a resistive load. Show that the average output voltage is given by

$$V_o = \frac{3\sqrt{3} V_{mp}}{\pi} \left[1 + \cos \left(\alpha + \frac{\pi}{3} \right) \right] \text{ for } \frac{\pi}{3} < \alpha < \frac{2\pi}{3}$$

where V_{mp} = maximum of phase voltage

8 + 7

8. a) Explain with appropriate waveforms, the different control strategies used for obtaining variable voltage from a dc chopper. Which one of these is preferred over the other and why ?

- b) Draw neatly the circuit diagram of a four quadrant chopper and explain its operation.

- c) For a type A chopper, dc source voltage = 230 V, load resistance = 10 Ω. Take a drop of 2V across chopper when it is on. For a duty cycle of 0.4, calculate

i) average and rms values of output voltage

ii) chopper efficiency.

5 + 5 + 5

9. a) Discuss the principle of working of a 3-phase bridge inverter with an appropriate circuit diagram. Draw phase and line voltage waveforms on the assumption that each SCR conducts for 180° and the resistive load is star connected. The sequence of firing of various SCRs should also be indicated in the diagram.

- b) Explain how the voltage of a single phase inverter is controlled by PWM techniques ?

8 + 7



10. a) What is a cycloconverter ?
- b) Describe the operating principle of a single phase to single phase step-up cycloconverter with the help of bridge type configuration. Illustrate your answer with appropriate circuit and waveforms. The conduction of various SCRs must also be indicated on the waveforms.
- c) Describe how the speed of a separately excited dc motor is controlled through the use of two single phase converters. Discuss how two-quadrant drive can be obtained from this scheme.

 $2 + 6 + 7$

11. Write notes on any two of the following :

 $2 \times 7\frac{1}{2} = 15$

- a) HDVC transmission
- b) Resonant converter
- c) GTO
- d) SMPS.

END