

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

15154

B. Tech 5th Semester Examination

Industrial Electronics (OS)

EC-5004

Time : 3 Hours

Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : (i) Attempt any five questions in all by selecting at least one question from each of the section A, B, C, D and section E is compulsory.

(ii) Assume suitable data if necessary.

SECTION - A

1. (a) Draw the symbols and applications of the following devices:
 - (i) SCR
 - (ii) Diac
 - (iii) Triac
 - (iv) Schottky diode (4×2=8)
- (b) Define:
 - (i) Latching current
 - (ii) Holding current
 - (iii) Forward breakover voltage (3×4=12)
2. (a) Explain with suitable diagram how DIAC and TRIAC can be used for speed regulator of fan. (10)

[P.T.O.]

2

15154

- (b) Explain the regenerative action of SCR with the help of two transistor analogy. (10)

SECTION - B

3. Explain single phase full wave half controlled bridge rectifier (asymmetrical configuration) with the help of circuit diagram and waveforms. Also explain why a separate FWD is not required in this case. (20)
4. (a) A single phase fully controlled bridge converter operates in the continuous conduction mode from a 230V, 50 Hz single phase supply with a firing angle $\alpha=30^\circ$. The load resistance and inductances are 10Ω and 50mH respectively. Find out the 6th harmonic load current as percentage of the average load current. (10)
- (b) Discuss effect of R-L & R-L-E load on full wave rectifier operation. (10)

SECTION - C

5. (a) Draw circuit diagram and waveform of 3-phase bridge inverter with R-load (180° mode of conduction). (10)
- (b) A 220V, 20A, 1500 RPM separately excited DC motor has an armature resistance of 0.75Ω and inductance of 50mH. The motor is supplied from a 230V, 50Hz, single phase supply through a fully controlled bridge converter. Find the no load speed of the motor and the speed of the motor at the boundary between continuous and discontinuous modes when $\alpha=25^\circ$. (10)
6. (a) Explain with neat diagram step-up chopper. Also derive the equation for output voltage (V_o). (8)
- (b) Compare AC and DC motors. (4)

3

15154

- (c) What do you mean by cycloconverter? Explain reasons of the limited applications of cycloconverter. (4)
- (d) What are the advantages of electronic control of a motor? (4)

SECTION - D

- 7. (a) Explain switched mode power supply. Discuss in detail step-up and step-down circuits for switched mode power supplies. (10)
- (b) Explain in detail integrated circuits for switched mode regulators. (10)
- 8. Explain in detail:
 - (a) Induction heating and its application
 - (b) Dielectric heating and its application (2×10=20)

SECTION - E

- 9. Directions: Fill in the blank(s) with appropriate word(s) from a to d
 - (a) In a single phase fully controlled converter the _____ of an uncontrolled converters are replaced by_____.
 - (b) The voltage form factor of a single phase fully controlled half wave converter with a resistive inductive load is _____ compared to the same converter with a resistive load.
 - (c) In a fully controlled converter the load voltage is controlled by controlling the _____ of the converter.
 - (d) A single phase half wave controlled converter always operates in the_____conduction mode.

[P.T.O.]

4

15154

- (e) Once SCR is triggered, the gate loses its control. Why?
- (f) Explain why cycloconverters are suitable for low frequency only?
- (g) Explain why RC triggering is preferred over resistance triggering process?
- (h) The latching current of SCR is 20 mA. What will be the holding current?
- (i) Latching current for an SCR inserted between a dc voltage source of 200 V and load is 100 mA. Compute the minimum rate of width pulse required to turn ON the SCR in case load consists of $R = 20\Omega$ in series with $L = 0.2$ H.
- (j) In a commutation circuit employed to turn off the SCR, what are the conditions to satisfactory turn off the SCR. (2×10=20)