



MBS-003-027401

Seat No. _____

M. Sc. ECI. (Sem. IV) (CBCS) Examination

April / May - 2018

Power Electronics : Paper - 13

Faculty Code : 003

Subject Code : 027401

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) All question carry equal marks.
(2) Figures on right hand side indicate marks.

1 Answer the following : (any fourteen) 14

- (1) In dc circuits the effect of unequal currents can be minimized by connecting _____ in series with the thyristors.
(A) Capacitor (B) Resistor
(C) Inductor (D) none of above
- (2) Which one is the most triggering method ?
(A) Voltage triggering (B) Gate triggering
(C) Turn-off (D) High-Temp triggering
- (3) Natural Commutation also known as _____
(A) Forced commutation
(B) Resonant commutation
(C) Class F commutation
(D) Auxiliary commutation
- (4) SCR has to turn off by a special commutation circuit using extra circuit components.
(A) line commutation
(B) Forced commutation
(C) Natural commutation
(D) None of above
- (5) Schottky diode has -silicon junction.
(A) Germanium (B) Aluminum
(C) Chromium (D) Carbon

- (6) FET is a unipolar device, N-channel FET; its operation depends on the flow of
- (A) Electrons (B) Holes
(C) Electrons-holes (D) None of above
- (7) FET is a Controlled device.
- (A) voltage (B) current
(C) resistance (D) none of above
- (8) BJT works as an in active region.
- (A) Switch (B) Amplifier
(C) Transistor is off (D) none of above
- (9) To improve the wave shape of load current and power factor, a diode is known as
- (A) PIN diode (B) Schottkey diode
(C) free wheeling diode (D) none of above
- (10) A semi converter is a quadrant converter.
- (A) One (B) Two
(C) One and two (D) none of above
- (11) A dual converter consist of fully controlled converters connected in anti-parallel
- (A) One (B) Two
(C) Three (D) none of above
- (12) When a negative signal is applied to a GTO, the anode current becomes zero instantaneously.
- (A) True (B) False
(C) True and false (D) none of above
- (13) A inverter is also known as
- (A) ac-ac converter (B) ac-dc converter
(C) dc-ac converter (D) none of above
- (14) Diode rectifiers are known as controlled rectifiers and thyristor rectifiers are known as uncontrolled rectifiers.
- (A) True (B) False
(C) True and false (D) False and true

- (15) Transistors don't require commutation in most of their applications while thyristors require commutation.
 (A) True (B) False
 (C) True and false (D) none of above
- (16) A single phase semi-converter bridge circuit uses
 (A) One thyristor
 (B) Two thyristors and two diode
 (C) One diode
 (D) none of above
- (17) IGBTs with buffer layer are termed as punch-through IGBT. (T/F)
- (18) An SCR can conduct in both directions. (T/F)
- (19) A TRIAC can be turned on by a positive gate signal only. (T/F)
- (20) Draw symbol of SCS.

2 Answer the following : (any **two**)

- (1) What is a thyristor ? Discuss its (SCR) operation and characteristics. **7**
- (2) Discuss the different methods of turning, on a thyristor. **7**
- (3) With the help of a neat diagram, explain the two transistor analogy of an SCR. **7**

3 Answer the following :

- (1) What is meant by commutation as SCR ? Give the classification of forced commutation. Draw circuits and explain any one methods of commutation of thyristors. **5**
- (2) What is a Unijunction transistor? Explain its configuration and characteristics. What are peak and valley points ? **5**
- (3) Give the comparison between transistors and thyristors. **4**

OR

- 3** Answer the following :
- (1) Draw the V-I characteristics of a Triac and explain its working principle. **5**
 - (2) Give names of triggering circuits for a thyristor. Draw and explain any one triggering circuits for a thyristor. **5**
 - (3) Give comparisons of BJT and FET. **4**
- 4** Answer the following : (any **two**)
- (1) Explain configuration of IGBT with vertical cross-section. Draw and discuss symbol and i-v characteristics (i.e. drain and transfer). **7**
 - (2) How does a GTO differ from a conventional thyristor. Describe the turn off process in a GTO with the help of appropriate voltage and current waveform ? **7**
 - (3) Why is it necessary to connect thyristors in series ? Draw static and dynamic equalizing circuits for thyristors in series and explain their operation. **7**
- 5** Answer the following : (any **two**)
- (1) Derive expression for various performance indices of a controlled rectifier circuits. **7**
 - (2) Explain the working of a single phase full wave controlled rectifier using a center tapped transformer feeding purely resistive load with wave shapes. **7**
 - (3) What is semi-converter ? Explain the single phase semi-converter with RLE load with its circuit and voltage, current wave shapes. **7**
 - (4) With the help of basic structural diagram explain the operation of static induction thyristor (SITH). Also, list the applications of SITH. **7**