

**B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024**

Sixth Semester

**Electronics and Instrumentation Engineering**

**20EIPC603 - POWER ELECTRONICS, DRIVES AND CONTROL**

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

**PART - A (MCQ) (20 × 1 = 20 Marks)**

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. The power semiconductor device known for its ability to handle high voltages and currents in switching applications is: (a) Diode                      (b) BJT                      (c) MOSFET                      (d) IGBT	1	K1	CO1
2. What is the main advantage of using a MOSFET in power electronic circuits? (a) High switching speed                      (b) Low power loss (c) High voltage capability                      (d) High current handling capacity	1	K1	CO1
3. Which power semiconductor device is primarily used in AC to DC rectification? (a) Triac                      (b) Thyristor                      (c) Diode                      (d) MOSFET	1	K1	CO1
4. A Silicon-Controlled Rectifier (SCR) is a type of: (a) Unidirectional switch                      (b) Bidirectional switch (c) Power diode                      (d) Bipolar junction transistor	1	K1	CO1
5. A controlled rectifier is a device that: (a) Converts AC to DC with controlled output voltage (b) Converts DC to AC (c) Controls the AC voltage by chopping the waveform (d) Converts DC to AC with controlled frequency	1	K1	CO2
6. In a single-phase half-wave controlled rectifier, the output DC voltage depends on the: (a) Load current                      (b) Input AC voltage and firing angle (c) Frequency of the AC supply                      (d) Type of rectifier used	1	K1	CO2
7. Which among the following is NOT a typical application of a controlled rectifier? (a) DC motor speed control                      (b) Power factor correction (c) AC voltage regulation                      (d) Battery charging	1	K1	CO2
8. In a single-phase full-wave controlled rectifier using thyristors, the output DC voltage is controlled by: (a) The output filter                      (b) The firing angle of the thyristors (c) The load resistance                      (d) The AC supply frequency	1	K1	CO2
9. In a boost converter, the output voltage is: (a) Higher than the input voltage                      (b) Equal to the input voltage (c) Lower than the input voltage                      (d) Inverted relative to the input voltage	1	K1	CO3
10. Which Type of DC to DC converter provides electrical isolation between input and output? (a) Buck converter                      (b) Boost converter                      (c) Fly back converter                      (d) Buck-boost converter	1	K1	CO3
11. In a buck converter, the main component that controls the switching is: (a) Diode                      (b) Inductor                      (c) Capacitor                      (d) Transistor (Switch)	1	K1	CO3
12. A major advantage of using a synchronous rectifier in a DC to DC converter is: (a) Reduced efficiency                      (b) Increased output voltage ripple (c) Lower conduction losses                      (d) Increased complexity in design	1	K1	CO3
13. In a single-phase inverter, the output waveform is typically: (a) Square wave                      (b) Sine wave                      (c) Triangular wave                      (d) Saw tooth wave	1	K1	CO4

14. Which type of inverter produces an output waveform closest to a sinusoidal wave? 1 K1 CO4  
 (a) Square wave inverter (b) Pure sine wave inverter  
 (c) Modified sine wave inverter (d) Current source inverter
15. In a three-phase inverter, the phase difference between the output voltages is typically: 1 K1 CO4  
 (a) 30° (b) 60° (c) 120° (d) 180°
16. The efficiency of an ideal inverter is: 1 K1 CO4  
 (a) 90% (b) 95% (c) 99% (d) 100%
17. The primary function of an electrical drive? 1 K1 CO5  
 (a) Energy conversion (b) Speed control of a motor  
 (c) Voltage regulation (d) Heat dissipation
18. The type of drive is commonly used in applications requiring precise speed control? 1 K1 CO5  
 (a) AC Drives (b) DC Drives (c) Stepper Motor Drives (d) Servo drives
19. In an electric drive, the torque is controlled by: 1 K1 CO5  
 (a) Speed regulation (b) Load variation  
 (c) Current in the motor (d) Voltage of the power supply
20. Which type of motor is most commonly used in industrial drives for variable speed applications? 1 K1 CO5  
 (a) Synchronous motor (b) DC motor (c) Induction motor (d) Stepper motor

**PART - B (10 × 2 = 20 Marks)**

Answer ALL Questions

21. List the advantages of Gate Turn On Thyristors(GTO) over Silicon Controlled Rectifier (SCR). 2 K1 CO1
22. Power BJT is a current controlled device. Why? 2 K2 CO1
23. Explain how the power factor of semi converter is better than full converter. 2 K2 CO2
24. Summarize the roles of freewheeling diode in a Full converter. 2 K2 CO2
25. Write down the control strategies for chopper circuit. 2 K2 CO3
26. Illustrate the term Duty cycle. 2 K2 CO3
27. Differentiate Current Source Inverter from Voltage Source Inverter. 2 K2 CO4
28. Why thyristors are not preferred for Inverter operation? 2 K1 CO4
29. State the advantages of DC chopper drives. 2 K2 CO5
30. Define static Ward-Leonard drive. 2 K1 CO5

**PART - C (6 × 10 = 60 Marks)**

Answer ALL Questions

31. a) Explain the steady state and switching characteristics of MOSFET. 10 K2 CO1  
**OR**
- b) Write short notes on: 10 K2 CO1  
 (i) Snubber circuit for BJT.  
 (ii) Commutation circuit of SCR.
32. a) Describe the operation of three phase semi converter with R load and also draw the output voltage waveforms for 30° and 90°. 10 K2 CO2  
**OR**
- b) With neat diagram discuss the operation of single-phase dual convertor with relevant waveforms. Obtain the expression of its instantaneous circulating current. 10 K2 CO2
33. a) Brief the working of buck converter with neat waveform and derive the expression for peak-to-peak voltage across the capacitor. 10 K2 CO3

**OR**

- b) A step down DC Chopper has input voltage of a 230V with 10 Ohms load resistor connected, voltage drop across chopper is 2V when it is ON. For a duty cycle of 0.5, Calculate: 10 K3 CO3  
 (i) Average and RMS value of output voltage.  
 (ii) Power delivered to load.
34. a) Discuss the principle of operation of 3 phase voltage source inverter with 180° conduction mode with necessary waveforms and circuits. Also obtain the expression for line-to-line voltage. 10 K2 CO4  
**OR**
- b) Describe the working of a single-phase full bridge inverter supplying RL loads with relevant circuit and waveforms. 10 K2 CO4
35. a) Explain about rectifier and chopper control of DC drives. 10 K2 CO5  
**OR**
- b) Outline the operation of vector controlled AC Drives. 10 K2 CO5
36. a) i) Summarize speed control of three phase induction motor by stator voltage control. 5 K2 CO4  
 ii) Describe the application of inverter in Battery Management System. 5 K2 CO5  
**OR**
- b) i) Illustrate any one method of harmonic control with a neat diagram 5 K2 CO4  
 ii) Describe the working of Rectifier based Electric Braking. 5 K2 CO5