

**B.E DEGREE EXAMINATIONS: OCTOBER / NOVEMBER – 2008**

Third Semester

**MECHATRONICS ENGINEERING****U07 MH 304 Power Electronics**

Time: Three Hours

Maximum Marks: 100

**PART–A (20X1=20 Marks)**

1. A power MOSFET has three terminals called
  - (a) collector ,base ,emitter
  - (b) drain ,source ,base
  - (c) drain, source, gate
  - (d) collector, emitter, gate
2. the secondary breakdown occurs in
  - (a) MOSFET but not in BJT
  - (b) both MOSFET and BJT
  - (c) BJT but not in MOSFET
  - (d) none of these
3. For an SCR ,dv/dt protection is achieved through the use of
  - (a) RL in series with SCR
  - (b) RC across SCR
  - (c) L in series with SCR
  - (d) L across SCR
4. In thyristor, ratio of latching current to holding current is
  - (a) 0.4
  - (b) 1.0
  - (c) 2.5
  - (d) 6.0
5. The number of thyristor required for 1 phase to 1 phase cycloconverter of the mid point type and for 3 phase to 3 phase 3 pulse type cycloconverter are respectively
  - (a) 4, 6
  - (b) 8, 18
  - (c) 4, 18
  - (d) 4, 36
6. Transformer Tap Changer is an application of
  - (a) Inverter
  - (b) converter
  - (c) AC voltage controller
  - (d) cycloconverter
7. Multiphase choppers consist of two more choppers connected in
  - (a) Parallel
  - (b) series
  - (c) parallel with diode
  - (d) series with inductance
8. In a  $3\Phi$  half wave diode rectifier, if  $V_m$  is the maximum value of per phase voltage, then each diode is subjected to a peak inverse voltage of
  - (a)  $V_m$
  - (b)  $\sqrt{3}V_m$
  - (c)  $2V_m$
  - (d)  $3V_m$

9. Choppers is shown as a
- (a) Switch
  - (b) switch inside dotted lines
  - (c) switch with diode
  - (d) switch with inductance
10. In voltage commutated chopper for mode I operation
- (a) T1 on
  - (b) T1 on & D on
  - (c) D on
  - (d) TA
11. The effect of source inductance on the performance of single phase and three phase full converters is to
- (a) reduce the ripples in the load current
  - (b) make discontinuous current as continuous
  - (c) reduce the output voltage
  - (d) increase the load voltage
12. Step up cycloconverter require
- (a) natural commutation
  - (b) forced commutation
  - (c) load commutation
  - (d) none of these
13. A single phase full bridge inverter can operate in load commutation mode in case load consists of
- (a) RL
  - (b) RLC underdamped
  - (c) RLC overdamped
  - (d) RLC critically damped
14. Magneto Hydrodynamic generator is a
- (a) converter
  - (b) inverter
  - (c) chopper
  - (d) cycloconverter
15. In a CSI, if frequency of output voltage is  $f$  Hz, then frequency of voltage input to CSI is
- (a)  $f$
  - (b)  $2f$
  - (c)  $f/2$
  - (d)  $3f$
16. For a 3 phase bridge inverter in 180 conduction mode the sequence of SCR conduction in the first two steps, beginning with the initiation of thyristor 1 is
- (a) 6, 1, 2 and 2, 3, 1
  - (b) 2, 3, 1 and 3, 4, 5
  - (c) 3, 4, 5 and 5, 6, 1
  - (d) 5, 6, 1 and 6, 1, 2

17. In a Single Phase full Converter, the output voltage during overlap is equal to

- (a) zero (b) source voltage  
(c) source voltage minus the inductance drop (d) inductance drop

18. A cycloconverter is a

- (a) frequency changer (fc) from higher to lower frequency with one stage conversion  
(b) fc from higher to lower frequency with two stage conversion  
(c) fc from lower to high frequency with one stage conversion  
(d) either (a) or (c)

19. In a Single Phase full Converter, if  $\alpha$  and  $\beta$  respectively, then the load current is

- (a) discontinuous if  $(\beta - \alpha) < \pi$  (b) discontinuous if  $(\beta - \alpha) \pi >$   
(c) discontinuous if  $(\beta - \alpha) = \pi$  (d) continuous if  $(\beta - \alpha) < \pi$

20. Power semiconductor used for a chopper circuit can be

- (a) diode (B) IGBT  
(c) TRIAC (D) SCR

### PART-B (5X16=80 Marks)

21. a) (i) Draw and explain with neat wave form the characteristics of thyristor.

(ii) Sketch the VI and transfer characteristics of IGBT and explain them.

(OR)

(b) (i) Explain the turn off characteristics of a GTO.

(ii) With a diagram, explain how the snubber circuit protects the thyristor.

22. (a) (i) Explain the operation of 3 $\Phi$  half controlled converter supplying RL load. Sketch

the output voltage waveform for a firing angle delay of  $\alpha < 60^\circ$ .

(OR)

(b) (i) With a aid of neat circuit diagram and waveform explain the effect of source inductance in 1  $\Phi$  full converter.

(ii) Explain any one triggering circuit for a 1  $\Phi$  controller rectifier.

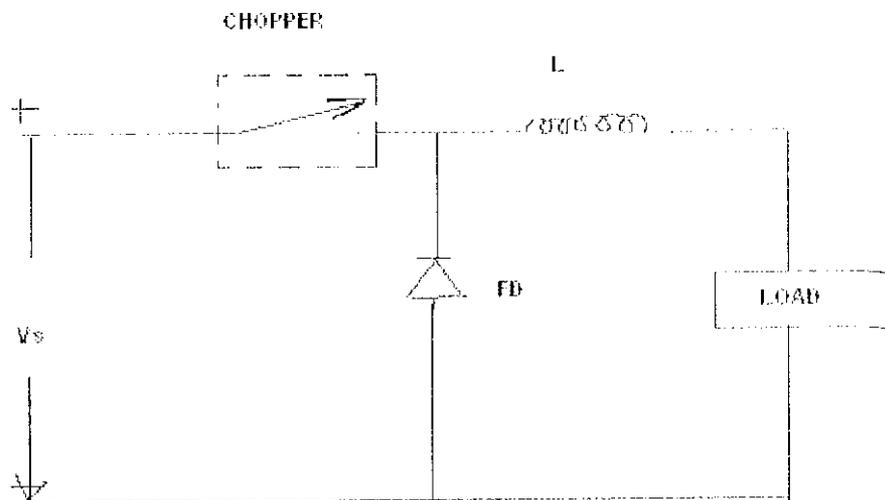
23. (a) (i) What are the different control strategies employed in chopper? Explain them in detail.

(ii) How is the two quadrant operation achieved in a chopper?

(OR)

(b) (i) For a chopper circuit shown in fig, DC source voltage=230V, Load resistance=10V, Take a voltage drop of 2V across choppeer when it is ON for a Duty cycle of 0.4. Calculate average output voltage and chopper

efficiency.



(ii) Draw the power circuit diagram of voltage commutated chopper. Explain its operation with relevant waveforms.

24.(a) (i) What are the commonly used PWM techniques for the control of the inverter. Explain one of them.

(ii) Describe the operation of a single phase full bridge inverter

**(OR)**

(b) (i) Explain the operation of  $3\Phi$  inverter for  $180^\circ$  mode and show the output voltage across any one phase with necessary equivalent circuits.

(ii) Draw and explain the basic series inverter circuit.

25. (a) Draw the power circuit of a  $1\Phi-1\Phi$  step down cycloconverter. Explain its operation with output voltage and current waveforms. Assume load current is continuous.

**(OR)**

(b) Draw and Explain the single phase AC voltage regulator with R load.

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