5th Semester Regular / Back Examination 2019-20
POWER ELECTRONICS
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : HRB076
Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1   Only Short Answer Type Questions (Answer All-10)   (2 x 10)
- a) Draw the static V-I characteristics of a TRIAC.
- b) Draw the static V-I characteristics of a MOSFET.
- c) What is harmonic factor ?
- d) Define TUF and PIV.
- e) What is forward voltage triggering of SCR ?
- f) Draw the complete SCR protection circuit.
- g) Compare 180° and 120° mode of conduction of VSI.
- h) In which types of rectifier free wheeling diode are required and why ?
- i) What is the effect of source impedance on the performance of converter ?
- j) Draw the circuit diagram of Buck-Boost regulators.

Part- II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   (6 x 8)
- a) Explain the principle of operation of Cosine firing scheme of SCR.
- b) Discuss the switching characteristics of MOSFET with neat sketch diagram and waveforms.
- c) Write down at least 6 comparison of MOSFET with BJT.
- d) Discuss the IGBT gate drive circuit.
- e) A single phase transformer, with secondary voltage of 230V, 50 Hz, delivers power to load R=10Ω through a half wave controlled rectifier circuit. For a firing angle delay of 60°, determine :
  - (i) rectification efficiency   (ii) form factor   (iii) voltage ripple factor
  - (iv) TUF   (v) PIV of thyristor.
- f) (i) A 3-phase full-converter charges a battery from a 3-phase supply of 230V, 50 Hz. The battery emf is 200V and its internal resistance is 0.5Ω. On account of inductance connected in series with battery, charging current is constant at 20A. Compute the firing angle delay and supply power factor.
  - (ii) In case it is desired that power flows from dc source to ac load in part (i), find the firing angle delay for the same circuit.
- g) A step-up chopper has input voltage of 220V and output voltage of 660V. If the conducting time of thyristor chopper is 100µs, compute the pulse width of the output voltage. In case of output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage.
- h) Explain the principle of sinusoidal pulse width modulation with neat sketch waveforms.
- i) A single phase half wave ac voltage controller feeds a load of R=20 Ω with an input voltage of 230 V, 50 Hz. Firing angle of thyristor is 45°. Determine :
  - (i) rms value of output voltage
  - (ii) power delivered to load and input pf
  - (iii) average input current.