Registration No.: | | | | | | | | | | |

Total Number of Pages: 02 **Course: IDD (B.Tech and M.Tech)**
Sub_Code: EEPC2005

4th Semester Regular Examination: 2025
SUBJECT: Power Electronics
BRANCH(S): EEE, ELECTRICAL, ELECTRICAL & C.E
Time: 3 Hours
Max Marks: 100
Q.Code: S517

Answer Question No.1 (Part-I) 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 **Answer the following questions:** **(2 x 10)**

a) What are the merits of single-phase bridge converter over single phase mid-point converter circuit?
b) Why an anti-parallel diode is connected across each MOSFET in Inverter?
c) Define latching current and holding current of a thyristor.
d) Can you achieve zero-degree firing angle for a SCR? Justify.
e) Why pulse gate drive is used for SCR?
f) Describe the principle of dc chopper operation.
g) With neat sketch explain the protection Circuit of SCR.
h) Out of frequency and duty cycle control which one is better and why?
i) What is the importance of blanking time in an inverter?
j) In a three phase six pulse diode rectifier, find the average output voltage in terms of maximum value of line voltage.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Draw and explain the dynamic characteristics of SCR during ON and OFF.
b) In a dc chopper, the average load current is 30 Amps, chopping frequency is 250 Hz. Supply voltage is 110 volts. Calculate the ON and OFF periods of the chopper if the load resistance is 2 ohms.
c) Explain the advantages and disadvantages of ac drives.
d) A single-phase half bridge rectifier having a supply voltage of $V_m \sin(\omega t)$ has a purely resistive load R. Determine
   I. efficiency
   II. the form factor
   III. the ripple factor
   IV. the transformer utilization factor
   V. the peak inverse voltage of diode the crest factor of input current

e) Explain the necessity of Using the Snubber Circuit.

f) How is SCR protected against dv/dt and di/dt? Explain with relevant circuit diagram.

g) A single-phase-to-single-phase cycloconverter is supplying an inductive load comprising of a Resistance of 5Ω and an inductance of 40 mH from a 230 V, 50 Hz single-phase supply. It is Required to provide an output frequency which is 1/3 of the input frequency. The converters are Operated as semi converter such that $0 \leq \alpha \leq \pi$ and firing delay angle is 120°. Neglecting the Harmonic content of load voltage, determine: (I) rms value of output voltage. (II) rms current of each thyristor and (III) input power factor.

h) Describe the principle of phase control in single phase half wave ac voltage controller.

i) Describe the operation of basic series inverter.

j) A number of SCRs, each with rating of 2000V and 50A, are to be used in series-parallel combination in a circuit to handle 11KV and 400A. For a derating factor of 0.15, calculate the number of SCRs in series and parallel units. The maximum difference in their reverse recovery charge is 20 microcoulombs. Calculate (I) the value of dynamic equalizing capacitance and (II) the voltage across each of the slow thyristor in case one series connected SCR is fast.

k) Draw the output voltage waveform of 3-phase full bridge thyristor rectifier for a firing angle of 30° explaining the operation of the converter.

l) Describe the principle of buck chopper. Derive an expression for the average output voltage in terms of input voltage and duty cycle.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four) **(16 x 2)**

Q3 A single-phase bridge inverter has a resistive load of R = 3.5Ω and dc input voltage is 100V. Determine (a) the rms output voltage at the fundamental frequency (b) The output power (c) the average and peak currents of each transistor (d) the peak reverse blocking voltage of each transistor (e) THD (f) The DF (g) The HF and DF of the LOH **(16)**

Q4 Explain the working principle of a four-quadrant chopper. **(16)**

Q5 Write short notes on **(8 x 2)**

(i) Sinusoidal PWM

(ii) First and second quadrant chopper converter.

Q6 Describe the basic principle of working of single phase to single phase step down cycloconverter for both continuous and discontinuous conductions for a Bridge type cycloconverter. **(16)**