Registration No :

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B.Tech

REC4D002/REE4C003/REI4D002/REL4C003

4th Semester Regular / Back Examination: 2022-23
SUBJECT: Power Electronics
BRANCH(S): ECE,ETC, EEE, AEIE,EIE, ELECTRICAL
Time : 3 Hour
Max Marks : 100
Q.Code: M277
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   Answer the following questions: (2 x 10)

   a)   State different types of diode and their applications.

   b)   What are the advantages of bipolar switching over unipolar switching in SPWM
        control strategy as applied to inverters?

   c)   What is the need of driver circuit in power switches?

   d)   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 2ohms.

   e)   What is a secondary breakdown of BJT?

   f)   Define latching current and holding current of a thyristor.

   g)   What is the importance of blanking time in an inverter?

   h)   What is the purpose of over modulation?

   i)   What is an IGBT? Describe its basic structure.

   j)   What are the merits and demerits of transformer gate isolation?

Part-II

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

   a)   Draw and explain the switching behavior of power BJT.

   b)   Explain gate Protection of Thyrister.

   c)   The parameters of UJT are V_s = 30 v, η = 0.51, I_P = 10µA, V_V = 3.5V and I_v = 10mA
        .The frequency of oscillation is f = 60Hz, and the width of triggering pulse is tg =
        50µs. Assume V_D = 0.5. Design the triggering circuit.

   d)   Draw and explain the structure and characteristics power MOSFET and explain
        how it is different from BJT.

   e)   Describe the principle of DC-DC buck converter operation. Derive an expression
        for its average output voltage.

f) A three phase half wave converter is supplying a load with a continuous constant current of 50A over a firing angle from 0° to 60°. What will be the power dissipated by the load at these limiting values of firing angle. The supply voltage is 415V (line).

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

h) A single phase fully controlled rectifier has 250 sin (314t) as input supply voltage and resistor R as load. What will be the average output voltage for firing angle 40° for this rectifier?

i) Draw the V-I and switching characteristics of thyristor.

j) A single PWM full bridge inverter feeds an RL load with R = 10Ω and L = 10 mH. If the source voltage is 120V, find out the total harmonic distortion in the output voltage and in the load current. The width of each pulse is 120° and the output frequency is 50Hz.

k) 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 output voltage. In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage.

l) Describe the operation of single phase voltage source inverter.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A single phase bridge inverter has a resistive load of R = 2.5Ω and dc input voltage is 50V. 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 in detailed the unipolar and bipolar switching schemes. **(16)**

Q5 Write short notes on any two **(16)**

    (i) Sinusoidal PWM

    (ii) Comparison between power MOSFET and BJT

    (iii) ZCS resonant Inverter

    (iv) Three-phase sinusoidal modulation

Q6 Explain the operation of 3 phase controlled full converter with R-L load with output waveforms. **(16)**