EEE-602

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121603

Roll No. ☐☐☐☐☐☐☐☐☐☐

B. Tech.

(SEM. VI) THEORY EXAMINATION, 2014-15

POWER ELECTRONICS

Time : **3 Hours**]   [Total Marks : **100**

Note: (1) Attempt all questions.
        (2) All questions carry equal marks.

1 Attempt any four parts: 5×4=20

(a) What are the characteristics of an ideal power switching device?

(b) Explain the switching characteristics of a BJT.

(c) Find the number of thyristors each with a rating of 500V and 75A required for each branch of a series parallel combination for a circuit for a total voltage and current rating of 7.5KV and 1 KA. Assume derating factor of 14%.

(d) Explain the significance of latching and holding currents.

(e) Explain the steady state and switching characteristics of MOSFET.

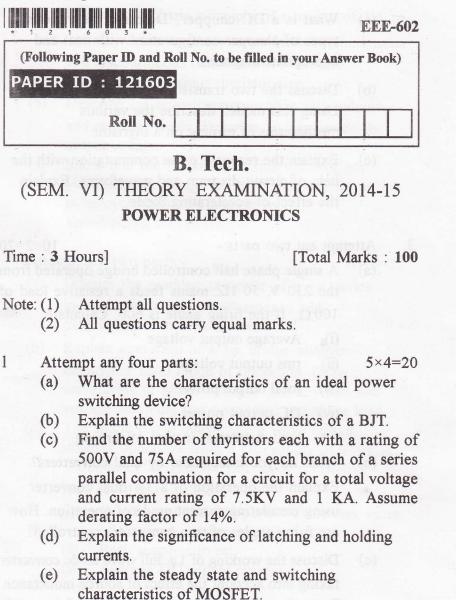(f) Explain working of Triac.

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2.   Attempt any two parts :   10×2=20

(a)   What is a DC chopper? Describe the various types of chopper configuration with neat and appropriate diagrams.

(b)   Discuss the two transistor model of a thyristor. Using this model, describe the various mechanisms of turning on a thyristor.

(c)   Explain the resonant pulse commutation with the help of circuit diagram and waveforms. Explain the effect of accelerating diode.

3.   Attempt ant two parts:-   10×2=20

(a)   A single phase half controlled bridge operated from the 230 V, 50 HZ mains feeds a resistive load of $100\,\Omega$. If the firing angle is 600, Calculate,

(i)   Average output voltage

(ii)   rms output voltage

(iii) total output power

(iv)   DC output power

(v)   load current at instant of turn on

(b)   What do you understand by dual converters? Explain the operation of a $3\,\phi$ dual converter using circulating current mode of operation. How are firing angles of two converters controlled?

(c)   Discuss the working of $1\,\phi$ full wave ac-dc converter taking into account the effect of source inductance. Draw the output voltage waveform for firing angle of 300.

4. Attempt ant two parts:-   10×2=20

    (a) Describe the basic principle of working of 1ϕ to
        1ϕ step down cycloconverter for both continuous
        and discontinuous conductions. Make the
        conduction of various thyristor also.

    (b) Describe 1ϕ ac voltage controller with inductive
        and resistive loads. Describe an expression for
        output voltage.

    (c) Show that the fundamental rms value of per
        phase output voltage of low frequency for an m
        pulse cycloconverter is given by:
        Vov=Vphmπ sinπm.

5. Attempt ant two parts:-   10×2=20

    (a) Discuss the working principle of a 1ϕ series
        inverter. What are the advantages and
        disadvantages of series inverter.

    (b) Explain operation of a 3ϕ bridge inverter
        employing 1200 mode of operation. Draw
        waveforms of phase voltages and any one line
        voltage assuming star connected resistance load.

    (c) The single phase quasi-square wave bridge
        inverter operators from a DC supply of 200v at
        a frequency of 100 Hz and feeds a resistive
        load of 10Ω calculate:
        (i)   Duration of the ON period if the rms value
              of the load voltage is 100v.
        (ii) Peak supply current
        (iii) Average DC supply current.

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