Date: 23/11/2016.

**Instructions:**

    (1) This Question paper has two sections. Attempt each section in separate answer book.

    (2) Figures on right indicate marks.

    (3) Be precise and to the point in answering the descriptive questions.

## SECTION-I

Q.1 (A) Discuss the principle of operation of buck Converter and draw the waveforms of triggering pulse, input current, inductor current, capacitor current and output voltage. [05]

    (B) A buck converter supplies 10 A to a load with a filter capacitor of 500 μF. The switching frequency is 10 kHz with 75 % duty cycle. Determine the ripple voltage in output. [05]

    (C) Define duty cycle. Give the equation of supply current for boost converter assuming a lossless circuit. [02]

### OR

Q.1 (A) Derive the equations of filter elements and their critical values required for boost converter. [06]

    (B) A chopper operating on TRC constant frequency principle is feeding a dc series motor having an armature resistance 0.06 ohm and field resistance 0.03 ohm. The average output current is 15 amp and the chopper frequency is 500 Hz. The back emf of the motor is 1000. Find the period of conduction and blocking. The chopper input is 200 Volts. [06]

Q.2 (A) Give the circuit diagram of 3 phase voltage source inverter and sketch the waveforms of switching patterns, pole voltages and line voltages for 150° mode of operation. [06]

    (B) Derive the expressions of output current and output voltage for 1-φ capacitor commutated current source inverter. [05]

### OR

Q.2 (A) Illustrate the working of single phase series inverter with necessary waveforms. [05]

    (B) For a single phase full bridge inverter, Vs. = 240V dc , T = 1 ms. The load consists of RLC in series with R = 20 Ω, ωL = 8Ω, 1/ωC = 12 Ω,
Find the power delivered to the load due to fundamental component.
Check whether force commutation is required or not, taking Thyristor turn off time as 120 μs [06]

Q.3 Attempt any two [12]

    (A) Discuss the basic principle of multilevel inverter and give the features of the same.

    (B) Draw a power schematic for one leg of capacitor clamped 3-level inverter and tabulate possible switching states for each of the voltage levels at $V_{ao}$.

    (C) Explain the operation of SEPIC converter with necessary diagrams.

Q.4  (A)  With phasor diagram explain YZ-1 transformer connection.          [06]

     (B)  Draw and explain 24 pulse diode Rectifier with neat sketch.        [06]

**OR**

Q.4  (A)  What are Multipulse AC-DC Converters? Which are the problems in present AC-DC Converters?          [06]

     (B)  Discuss 6 pulse diode Rectifier with waveforms.          [06]

Q.5  (A)  Write short note on Opto isolator with suitable circuit diagram.          [06]

     (B)  Estimate the minimum and maximum charging resistor of UJT circuit for control of $\alpha$ between 20° and 160° of 50 Hz supply. Assume $C = 0.1\ \mu F$ and $\eta = 0.7$.          [05]

**OR**

Q.5  (A)  Explain construction details of pulse transformer and write the advantage and disadvantage of pulse transformer.          [05]

     (B)  Draw & Explain Resistive firing circuit for Thyristor.          [06]

Q.6  Attempt any two.          [12]

     (A)  Draw a power schematic for one leg of cascaded H bridge 5-level inverter and explain it.

     (B)  Design a three-level diode clamped inverter with dc link-voltage of this inverter is 440 V dc. Draw the power circuitry of one leg of this inverter.

     (C)  Calculate the pole voltages for following switching states :
          i)   (- + +)
          ii)  (- + -)

--------------------------------------------END OF PAPER--------------------------------------------