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

Total Number of Pages : 02 **M.Tech.**
P2PDCC01

2nd Semester Regular / Back Examination 2017-18
ADVANCED POWER CONVERTER
BRANCH : ELECTRICAL AND ELECTRO ENGG, POWER ELECTRO, POWER ELECTRO & DRIVES, POWER ELECTRO AND ELECTRICAL DRIVES, POWER ELECTRO AND POWER SYSTEMS
Time : 3 Hours
Max Marks : 100
Q.CODE : C640

Answer Question No.1 which is compulsory and any FOUR from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions: *Short answer type :*** **(2 x 10)**

a) What is the difference between 180 degree and 120 degree conduction three phase bridge Inverter? Write the expression for the phase voltage in both the conduction mode.
b) What is the difference between Harmonic Factor and Total Harmonic Distortion?
c) Write the advantages of cascaded multilevel inverter.
d) What do you understand by Null Vector in Space Vector Modulation technique?
e) Explain in brief, how forward converter is better than flyback converter?
f) How does the quality of the output voltage waveform effects, if a step-down DC-DC converter is operated with a switching frequency of 50Hz?
g) Draw the various switching configuration for Zero Voltage Switching resonant converter.
h) The transformer utilization factor of a rectifier is 0.286. Determine the rating of the transformer required to deliver 10W dc power to the load.
i) Three phase half wave rectifier is connected to a resistive load, where the conduction angle of each diode is $2\pi/3$. Draw the waveform of the (i) voltage across resistive load (ii) current through diode in any one phase.
j) In the Sinusoidal Pulse Width Modulation technique, what is the significance of modulating frequency in bipolar and unipolar switching?

Q2 **a)** Draw the circuit diagram for a fly back converter, switch mode DC power supply. Also draw the waveform of the current through load and the voltage across the switch. **(10)**
b) Write a shot note on two-level Space Vector Modulation and obtain the voltage vector for different switching states. **(10)**

Q3 **a)** Derive the expression for the current in a step up DC-DC converter feed to a resistive load. **(10)**
b) Explain the working of Cuk regulator with the help of suitable circuit diagram. **(10)**

Q4 **a)** A single-phase bridge-rectifier is supplied from a 220V, 50Hz source. The load resistance is R=500Ω. (a) Design a C filter so that the ripple factor of the output voltage is less than 5%, (b) With the value of capacitor C in part(a), calculate the average load voltage V_{dc}. **(10)**
b) With the help of suitable circuit diagram, explain the working of single phase dual converter. **(10)**

Q5 **a)** A 3-level Cascaded Multilevel Inverter is used to generate 7-level output voltage waveform. Obtain the Fourier series expression of the output voltage waveform. **(10)**

b) Draw the circuit diagram of a modified 5-level diode-clamped inverter with distributed clamping diode. And explain the forward path and free-wheeling path for any two levels. **(10)**

Q6 **a)** Derive the Fourier series expression of the output voltage for a Half-Wave Rectifier. **(10)**

b) A battery of 12V is charged from a Half-wave rectifier circuit, its capacity is 100Wh. The average charging current should be I_{dc}=5A. The input voltage is 60V, 50Hz. Calculate (a) The conduction angle of the diode, (b) the current limiting resistance R, (c) The power rating P_R of R. **(10)**

Q7 **a)** Draw a suitable diagram for M-type Zero Current Switching (ZCS) resonant converter. And obtained the waveform of the current through inductor and voltage across capacitor. **(10)**

b) Explain in brief the various modes of operations in M-type ZCS resonant converter. **(10)**