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Total Pages : 4

**451103**

**December, 2019**

**M.Tech. (PED) - 1st SEMESTER**

**Advanced Power Electronic Circuits (MPED-103)**

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

**PART - A**

1. (a) Write the advantages of cascaded H bridge Inverter.  
CO5 1.5
- (b) What are the main features of flying capacitor multi-level inverter.  
CO5 1.5
- (c) Why the size of transformer in a forward converter can be made smaller than that of a fly-back converter?  
CO3 1.5

- (d) What are the various arrangements of resonant dc power supplies? CO4 1.5
- (e) Enlist various methods of power factor improvement in phase controlled converters. CO1 1.5
- (f) Differentiate between unidirectional core excitation converter and bidirectional core excitation converter. CO3 1.5
- (g) Distinguish between PWM and frequency modulation technique of output voltage control of DC to DC converter. CO2 1.5
- (h) Draw the circuit diagram for a rectifier fed DC drive. CO6 1.5
- (i) Which type of commutation technique is used in inverters and why? CO1 1.5
- (j) Write the applications of HVDC transmission system. CO6 1.5

### **PART - B**

2. (A) Discuss the working of a push pull converter using appropriate circuit diagram and waveforms. CO3 (7.5)

(B) The average (or dc) output voltage of the forward converter circuit is  $V_0 = 24V$  at a resistive load of  $R = 0.8 \Omega$ . The on state voltage drops of transistors and diodes are  $1.2 V$  and  $0.7 V$ , respectively. The duty cycle is  $k = 40\%$  and the switching frequency is  $f = 1 \text{ kHz}$ . The dc supply voltage  $V_s = 12V$ . The turns ratio of the transformer is  $a = N_s/N_p = 0.25$ . Determine (a) The average input current (b) the efficiency  $\eta$ , (c) The average transistor current  $I_a$ , (d) The peak transistor current  $I_p$ , (e) The RMS transistor current  $I_R$ , (f) The open circuit transistor voltage  $V_{oc}$ . (g) The primary magnetising inductor  $L_p$ . Neglect the losses. CO3 (7.5)

3. What is a Resonant converter. Discuss various modes of operation of a zero voltage switching resonant converter along with suitable waveform and circuit diagram. Also derive the expression for various time intervals. CO4 (15)

4. (a) Describe the operation of a Boost converter in continuous & discontinuous conduction mode. Derive the expression relating output voltage and input voltage. CO2 (7.5)

- (b) A Buck converter has a load resistance of 20 ohms and input DC voltage of 200 V. When the chopper switch is on, the voltage drop across it is 2 V. If the chopping frequency is 1.5 KHz and duty ratio is 40%, determine average and rms DC output voltage and efficiency of chopper. CO2 (7.5)
5. (a) Explain how a staircase output voltage can be generated by a diode clamped multilevel inverter. Also show voltage levels and their switch states. CO5 (7.5)
- (b) Discuss the application of multilevel inverter in reactive power compensation. CO5 (7.5)
6. (a) Draw the block diagram of UPS system and explain its various components. CO6 (7.5)
- (b) How Power Electronic converters are useful in Induction heating, explain with suitable diagram. CO6 (7.5)
7. Write short notes on :
- (i) Single phase mid point phase controlled converter.
- (ii) Boost type APFC converter. CO1 (15)
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