

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2170906

Date: 15/11/2018

Subject Name: Advanced Power Electronics

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1**
- (a) Compare buck, boost and buck-boost converter with reference to technical parameters. **03**
 - (b) Write the advantages of resonance converter as compared to PWM converter. **04**
 - (c) Illustrate the push pull converter with neat circuit diagram & waveform and derive the equation of output voltage in terms of input voltage & duty cycle. **07**

- Q.2**
- (a) Define duty cycle and write its importance. **03**
 - (b) Differentiate between continuous mode of conduction and discontinuous mode of conduction. **04**
 - (c) Justify the name of converter as zero voltage switching converter with necessary diagram and waveform. **07**

OR

- (c) Illustrate how the harmonic current are canceled by phase shifting transformer in 12 pulse rectifier. **07**

- Q.3**
- (a) Compare the three topologies of multilevel inverter. **03**
 - (b) Compare HVAC and HVDC transmission line. **04**
 - (c) The buck-boost regulator has an input voltage = 12 V, duty cycle = 0.25, switching frequency = 25 kHz, inductor = 150 μ H, filter capacitor = 220 μ F and average load current = 1.25 A. Determine (a) Average output voltage (b) Peak to peak output voltage ripple (c) Peak to peak ripple current (d) Peak current of switch (e) Critical value of L and C. **07**

OR

- Q.3**
- (a) Introduce the multi pulse converter. **03**
 - (b) Draw circuit diagram of 9 level asymmetric cascaded H bridge multilevel inverter and mention the switching states to generate 0 level. **04**
 - (c) The class E resonance inverter operates at resonance and has $V_s = 12$ V, $R = 10 \Omega$, $f_s = 25$ kHz and $Q = 7$. Determine optimum value of L, C, C_e and L_e . **07**

- Q.4**
- (a) Draw block diagram of HVDC transmission system. Mention equipment required for HVDC system. **03**
 - (b) Justify: ZVS is better than ZCS. **04**
 - (c) Explain in detail about rectifier and inverter control characteristic of HVDC converter. **07**

OR

- Q.4**
- (a) State the need of reactive power compensation. **03**
 - (b) Draw and explain bipolar HVDC power transmission system based on 12 pulse converters for each pole. **04**
 - (c) Discuss the operation of thyristor switched capacitor. **07**

- Q.5**
- (a) Compare SVC and STATCOM. **03**

(b) Classify carrier based PWM technique for multilevel inverter. Discuss any one in detail. 04

(c) Explain in brief about FACTS. 07

OR

Q.5 (a) Explain star/delta phase shifting transformer with phasor diagram. 03

(b) Write the advantages and limitations of SSSC. 04

(c) Explain how multilevel inverter is used as reactive power compensator with necessary vector diagram. 07
