

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E Sem-I Regular Examination January / February 2011****Subject code: 710702N****Subject Name: Advanced Power Electronics****Date: 01 /02 /2011****Time: 02.30 pm – 05.00 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) Explain single quadrant and two quadrant operation of switch. Suggest power semiconductor devices capable to realize it. **07**
- (b) How design of magnetic components used in power electronic circuit is different than when used in normal electric circuits? Explain 'Area of Product' method in brief. **07**
- Q.2** (a) Compare SCR, GTO, power MOSFET and IGBT. **07**
- (b) With neat diagrams analyze operation of buck-boost converter in continuous mode. **07**
- OR**
- (b) Elaborate SMPS design criterion. **07**
- Q.3** (a) Explain full bridge dc-dc converter. **07**
- (b) Explain operation of 3-phase bridge inverter with 150° conduction mode. Comment on this mode compared to 120° and 180° conduction. **07**
- OR**
- Q.3** (a) Design a transformer for forward converter to operate under following conditions: **07**
 $f_s=100$ kHz, $V_1=V_2=V_3=30$ V, Assume RMS value of current in each winding to be 2.5 A. Assume $B_{\max}=0.25$ T, $J_{\max}=5$ A/mm², $k_w=0.5$ and $k_{\text{conv}}=0.5$. Suitable assumptions are permissible.
- (b) Why pulse width modulation techniques are required? Discuss sine PWM technique in brief with appropriate waveforms. **07**
- Q.4** (a) A 400 V, 3-phase, 50 Hz, 5 HP induction motor is connected with 3-phase bridge inverter. The output capacitor is sufficiently large to yield the constant output voltage. Which PWM method is suitable to operate motor at full load? Justify your answer. **07**
- (b) Discuss harmonic reduction techniques in brief. **07**
- OR**
- Q.4** (a) Compare sine PWM technique with SVPWM technique. Prove that output voltage amplitude obtained in SVPWM technique is 15.5 % higher than that obtained in sine SCPWM technique. **07**
- (b) Give classification of inverters. With schematic explain 3-phase bridge inverter. **07**
- Q.5** (a) Explain the need of driver circuit. Explain importance of isolation in driver circuits. **07**
- (b) Explain block diagram of thyristor gating circuit. **07**
- OR**
- Q.5** (a) Discuss isolation of gate and base drives. **07**
- (b) Explain operation of current source inverter with neat diagram. Differentiate it from voltage source inverter. **07**
