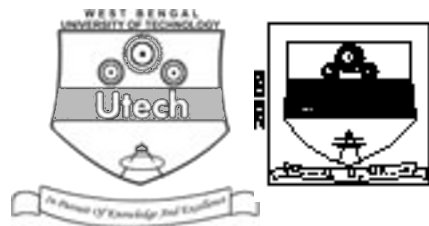


POWER ELECTRONICS (SEMESTER - 6)

CS/B.TECH (ECE-N)/SEM-6/EC-603/09



1.
Signature of Invigilator

2.
Signature of the Officer-in-Charge

Reg. No.

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Roll No. of the Candidate

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CS/B.TECH (ECE-N)/SEM-6/EC-603/09
ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009
POWER ELECTRONICS (SEMESTER - 6)

Time : 3 Hours]

[Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
b) For **Groups – B & C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

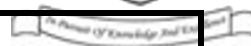
FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B					Group – C					Total Marks	Examiner's Signature
Question Number																						
Marks Obtained																						

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Head-Examiner/Co-Ordinator/Scrutineer

6724 (09/06)



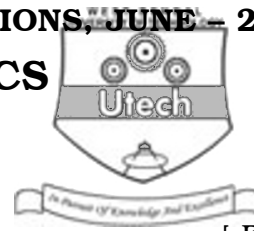
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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

POWER ELECTRONICS

SEMESTER - 6



Time : 3 Hours]

[Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10
- i) The main reason for connecting a pulse transformer at the output stage of an SCR firing circuit is to
- a) amplify power of the triggering pulse
- b) provide electric isolation
- c) reduce the turn on time of the SCR
- d) avoid spurious triggering of SCR due to noise. ☐
- ii) Each diode of a 3-phase half diode rectifier conducts for
- a) 60° b) 120°
- c) 180° d) 90°. ☐
- iii) In a controlled rectifier, a freewheeling diode is necessary if the load is
- a) inductive b) resistive
- c) capacitive d) any of these. ☐
- iv) It is possible to connect two or more MOSFETs in parallel because
- a) the threshold value of the gate to source voltage is only 2-3 V
- b) fast switching times are obtainable with it
- c) the MOSFET has a very small power loss under high frequency conditions
- d) the MOSFET resistance has a positive temperature coefficient. ☐

- _____

- ly resistive load

-

- _____

- _____

- _____



5

x) RC snubber circuit is used to protect an SCR against

- | | |
|-------------------------|------------------------|
| a) false triggering | b) failure to turn on |
| c) switching transients | d) failure to commute. |



xi) A 1 – ϕ full bridge inverter can operate in load commutation mode in case load consists of

- | | |
|--------------------------|--------------------|
| a) RLC overdamped | b) RLC underdamped |
| c) RLC critically damped | d) all of these. |

xii) The inverter circuit used in a UPS, the value of percentage total harmonic distortion should be

- | | |
|----------|----------|
| a) < 5% | b) < 10% |
| c) < 15% | d) < 2%. |

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions.

3 × 5 = 15

- Draw and explain dynamic switching characteristics of BJT.
- 'SCR is self latching device.' Explain the statement with the help of two transistor analogy of SCR.
- Explain with necessary waveforms, the principle of operation of an RC triggering circuit.
- What are the advantages of zero-current and zero voltage converters over conventional D.C. to D.C. converters. State the concept of quasi-resonant converter.
- A single phase halfwave inverter feeds a resistive load $R_L = 10 \Omega$. Source voltage is 240 V D.C. Determine the r.m.s. voltage, output power and r.m.s. value of current.

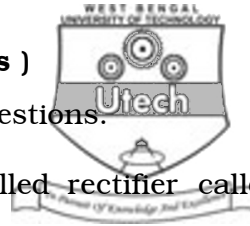
3 + 2



6
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions.



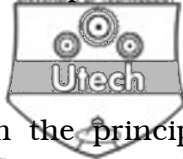
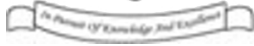
$3 \times 15 = 45$

7. a) Why is a three phase bridge full wave controlled rectifier called a six-pulse converter ? Explain with circuit diagram and output waveforms.
- b) A three-phase, six-pulse converter is operated from a 3-phase star connected 400 V, 50 Hz supply and with resistive load of 10Ω . Load inductance is negligible. It is required to obtain an average output voltage equal to 50% of the maximum possible output voltage of the rectifier.

Find at this condition,

- i) firing angle
 - ii) the average output voltage
 - iii) the average current of each SCR
 - iv) PIV requirement of each SCR
 - v) rectification efficiency. $5 + 10$
8. a) Explain with a neat circuit diagram, the operation of a Buck-broost converter.
- b) A step-down chopper feeds a D.C. motor load. The data pertaining to this chopper based drive are $E = 210 \text{ V}$, $R_a = 7 \Omega$, L (including armature inductance) = 12 mH . Chopper frequency = 1.5 kHz , duty cycle = 0.55 and $E_b = 55 \text{ V}$. Assuming continuous conduction, determine
- i) the average load current
 - ii) current ripple
 - iii) RMS value of current through chopper. $5 + 10$
9. a) Describe with the help of necessary voltage waveforms and circuit diagram, the operation of a three phase voltage source inverter with 120° conduction mode delivering power to star connected pure resistive load.
- b) Explain how the output voltage of a single phase inverter is controlled by sinusoidal PWM. $10 + 5$



10. a) With the help of block diagram, explain the principle of operation of UPS.  7 + 8
- b) Write note on resonant converter.
11. a) With the help of suitable circuit diagrams, explain the principle of a flyback converter.  7 + 8
- b) Discuss any scheme of microprocessor based triggering angle control. 7 + 8

END