

BE ETXX
SEM VII
May 2014

Power Electronics & Drive

QP Code : **MV-20099**

(3 Hours)

[Total Marks : 100

- N. B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six** questions.
(3) Figures to the **right** indicate **full** marks.
(4) **Assume** suitable **data** wherever required but **justify** it.

1. Answer the following :- 20
 - (a) Compare symmetrical and asymmetrical semi-converter.
 - (b) What is meant by voltage commutation and current commutation.
 - (c) Compare series and parallel inverter.
 - (d) What is four quadrant DC - drive.

2. (a) Explain sinusoidal pulse modulation as used in PWM inverter. 10
(b) A load commutated chopper fed from 230 V d.c. source has a constant load current of 50 A. For a duty cycle of 0.4 and chopping frequency of 2kHz. Calculate :- 10
 - (i) Value of commutating capacitor.
 - (ii) Average output voltage.
 - (iii) Circuit turn off time for 1-pair of SCRs.
 - (iv) Total commutation interval.

3. (a) Explain the working of a single phase series inverter with appropriate circuit and waveforms. 10
(b) Explain constant torque and constant power operation of separately excited DC motor. Give schematic diagram of control unit. 10

4. (a) A single phase fully controlled bridge with 230 V, 50 HZ supply feeds continuous ripple free current of 20A. If $L_s = 2.5$ mH. 10
 - (i) Calculate overlap angle for firing angle 60° .
 - (ii) What will be the new value of overlap angle for same firing angle if load is reduced by 50%.
(b) Draw and explain the variable voltage and variable frequency control method for 3-phase squirrel cage induction motor. What is the significance of (V/F) ratio control. 10

5. (a) A single phase full converter is used to drive separately excited dc shunt motor with $R_a = 0.25$ Ω . Motor rating are 220 V, 750 rpm, 50 A. If input voltage to converter connected to armature is 250 V a.c. 50 Hz. Calculate :- 10
 - (i) Firing angle delay for 500 rpm at rated torque.
 - (ii) Speed of motor for firing angle $\alpha = 60^\circ$ at half load.
(b) Explain the working of Jone's chopper with the help of various waveforms. 10

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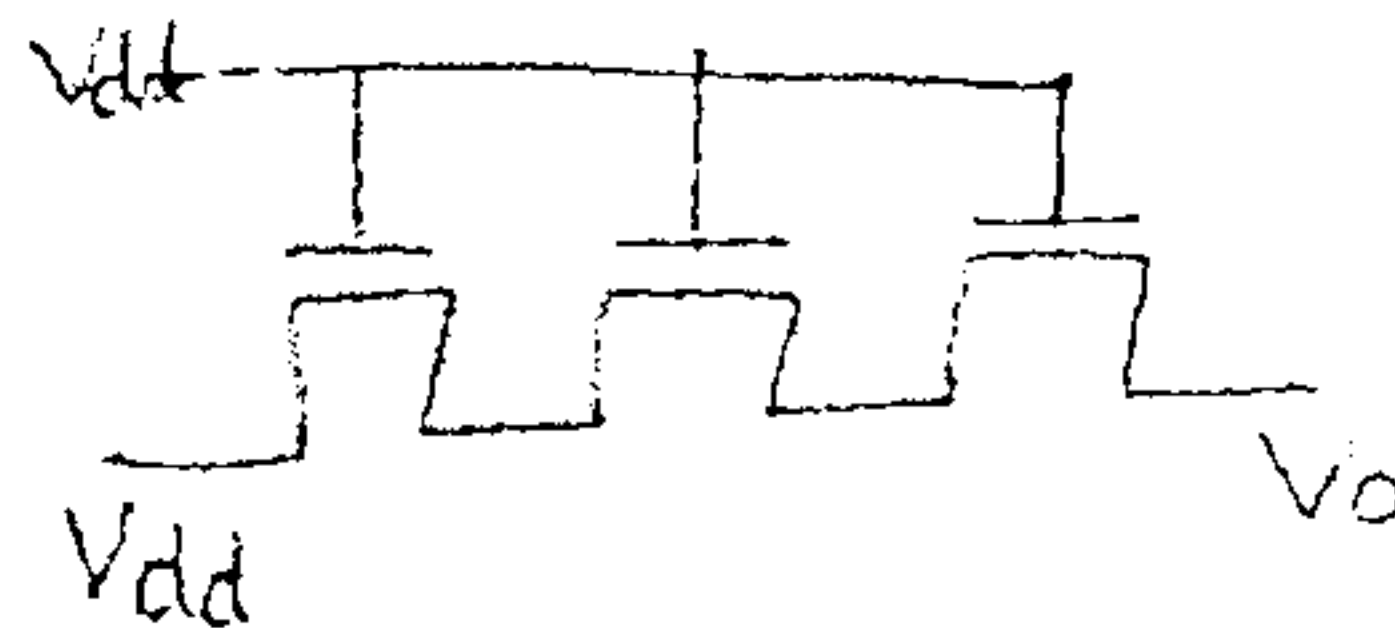
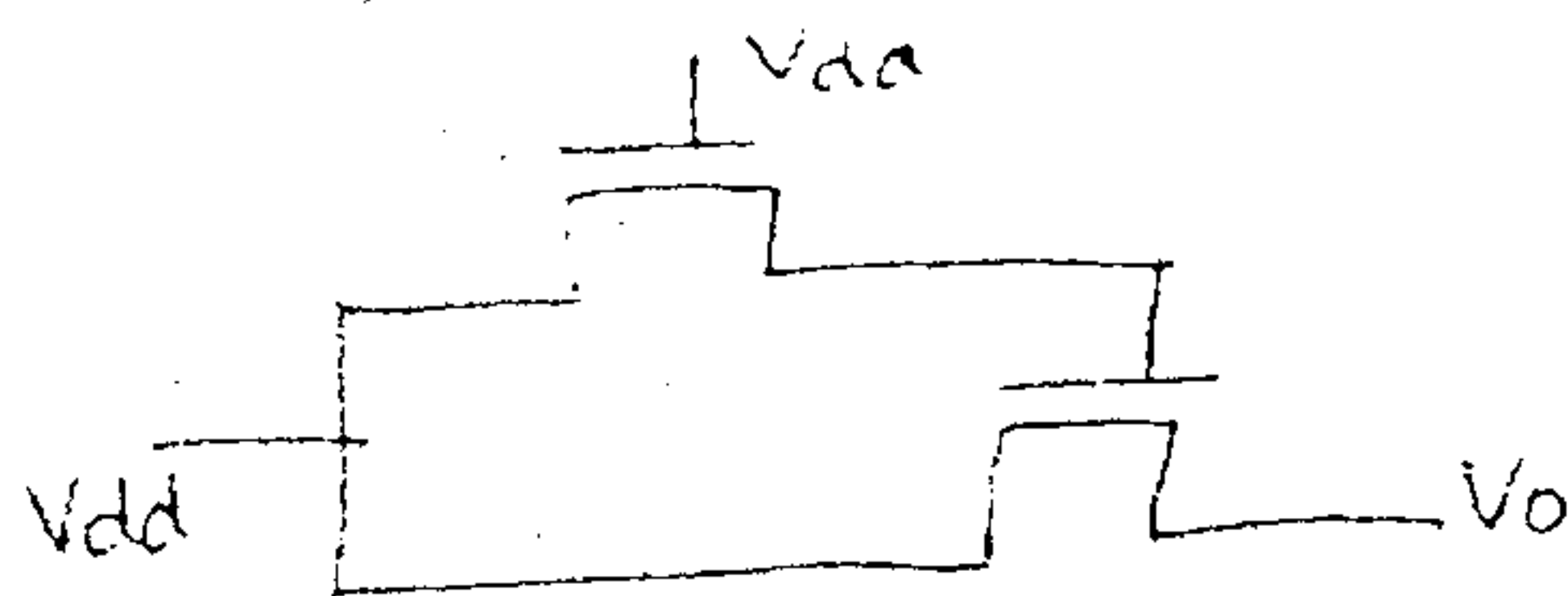
6. (a) Give the advantages of flyback converter compared to forward converter. **10**
With the help of neat circuit diagram and wave form, explain the operation of isolated forward converter.
- (b) Using block diagram discuss different configurations of UPS. **10**
7. Write short notes :- **20**
- (a) Dual converter
 - (b) Mc-Murray inverter
 - (c) Four quadrant chopper.
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- N. B. : (1) Question no. **one** is compulsory.
 (2) Solve **any four** questions from remaining questions.
 (3) Draw neat diagrams wherever required.

1. Answer the following questions (write **any 4**).

20

- (a) The segregation coefficient of O_2 is 0.25. Find the concentration of oxygen in the silicon ingot at a fraction solidified of 0.3. The concentration of O_2 in the silicon at the top of the crystal is 12.5×10^{17} atoms/cm³ at a fraction solidified of 0.1?
- (b) Draw the schematic, stick diagram of a NMOS depletion load inverter?
- (c) Explain what is pass transistor logic? Calculate the output voltage for the following circuits if $V_{dd} = 5V$ and $V_{th} = 1.5 V$.



- (d) Define threshold voltage with equation and explain body effect?
- (e) State the difference between diffusion and ion implantation?
2. (a) With neat cross sectional diagram explain the process of CMOS fabrication using pwell process. Thus given the number of masks required. 10

- (b) Consider on aluminium - silicon dioxide - silicon MOS structure with the following parameters. 10

$$N_d = 2.5 \times 10^{14}/\text{cm}^3$$

$$Q_{ox} = 10^{10} \text{ cm}^2$$

$$T_{ox} = 650 \text{ \AA}$$

$$\phi_{ms} = -0.35V$$

$$\text{Given } n_i = 1.45 \times 10^{10}/\text{cm}^3, \epsilon_o = 8.85 \times 10^{-14}$$

$$\epsilon_{si} = 11.7, \epsilon_{ox} = 3.97\epsilon_o$$

Determine the threshold voltage of the device.

3. (a) Draw the circuit diagram of two input NAND gate using CMOS. Draw its stick diagram and layout using λ based rules. 10
- (b) State all types of inverters and compare them with their merits, demerits and applications. 10
4. (a) Determine pullup to pulldown ratio $\left(\frac{Z_{pu}}{Z_{pd}}\right)$ for an NMOS inverter driven by another NMOS inverter? 10
- (b) Explain latchup condition in CMOS in detail. What are the remedies to avoid latchup? 10
5. (a) A CMOS logic gate that implements the function. 10
- $$F = X \cdot (Y + Z) + X \cdot W$$
- is needed in a control network. Design the logic circuit and draw the stick diagram using Euler's method?
- (b) Design 4:1 MUX using CMOS transmission gate logic. Draw the stick diagram of the same design? 10
6. (a) Compare both the scaling methods? Show analytically how power dissipation, maximum operating frequency, current density and saturation current scale in terms of scaling factors? 10
- (b) Write switch level verilog code for a 2 input NAND gate. Using the module of NAND gate, design SR-Latch and write the switch level verilog code for the same. 10
7. Write short notes on any two: 20
- (i) Short channel effects in MOSFETs
 - (ii) Comparison of buried and butting contacts.
 - (iii) Semicustom and Full custom design.

QP Code : **MV-20034**

(3 Hours)

[Total Marks : 100

N. B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** out of the remaining **six** questions.

(3) Assume suitable **data** if required.

(4) **Figures to the right** indicate **full** marks.

1. (a) What is mobile assisted Hand off? Explain strategy. 5
- (b) Explain orthogonal covering in CDMA. 5
- (c) What is macro-cell zone concept? 5
- (d) Explain spectral efficiency and pulse shaping in OFDM? 5
2. (a) Draw a neat block diagram for signal processing in GSM and hence explain. 10
- (b) Explain with architecture :- 10
 - (i) High speed circuit switched data in GSM.
 - (ii) General Packer Radio Services (GPRS).
3. (a) Explain the need of spreading the sequence in CDMA. Explain DS-SS transmitter and Receiver with neat block diagram. 10
- (b) Explain MAC sub layer of CDMA 2000 in detail. 10
4. (a) Explain OFDM block diagram and derive the mathematical expression for OFDM signal. 10
- (b) Explain in detail the working of RAKE receiver. 10
5. (a) Explain the Authentication, Cipher key generation and Encryption process in GSM. 10
- (b) Prove that for a hexagonal geometry, the co-channel reuse ratio is given by $Q = \sqrt{3N}$, where $N = i^2 + ij + j^2$. Comment on cell splitting. 10
6. (a) Explain different security. Algorithms for GSM. 10
- (b) Explain CDMA channel modulation process with the help of neat block diagram. 10
7. Write short notes on any three :- 20
 - (a) Subscriber identity module.
 - (b) Bluetooth.
 - (c) WiMAX.
 - (d) Zigbee.