

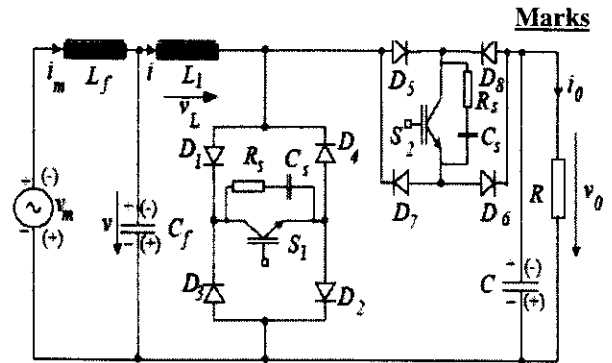


Allowed Tables and Charts: (None)

Answer all Questions [100 Marks]

**Question (1) (20Marks)**

- (a) In the circuit shown,  $V_m=220v$  and  $R=60\Omega$ . If the duty ratio,  $D$  change from 0.2 to 0.5 and  $f=10kHz$ . Calculate the limited normalized current and voltage ripple, if  $L_1=30mH$  and  $C=10\mu F$ . Determine the average and maximum repetitive current through  $S_1$  &  $S_2$  and the voltage stress of the IGBTs.



- (b) Using six IGBT switches, three inductor and three capacitors, Sketch the power circuit of: [10]
- I- 3-phase a.c. buck chopper.
  - II- 3-phase a.c. boost chopper.
  - III- 3-phase a.c. buck-boost chopper.

**Question (2) (20Marks)**

- (a) Explain briefly types of active power filter topologies implemented with PWM-VSI. Then, [1] indicate the power quality problems that can be solved using each type.
- (b) Explain with suitable drawings the power circuit topologies and control scheme of Shunt [1] Active Power Filters

**Question (3) (20Marks)**

- (a) Explain briefly with suitable drawings HVDC System Configurations. [10]  
 Then, describe advantages and disadvantages of HVDC system over AC [10] transmission .

**Question (4) (20Marks)**

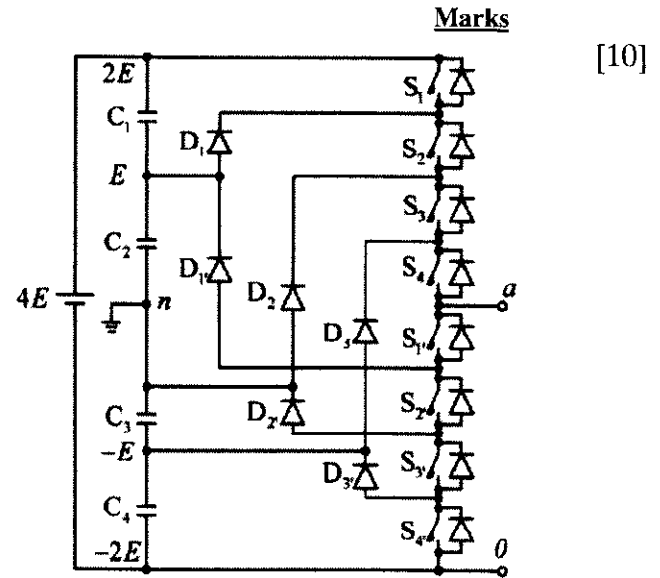
- (a) In PV system, several algorithms can be used to accomplish MPPT . Describe the [10] following algorithms:
- 1- Perturb and Observe (PAO)
  - 2- Incremental Conductance Technique (ICT)

- (b) For PV Inverter Topologies, sketch the basic block diagram for these type of inverter: [10]
- Multilevel converter.
  - Non- insulated voltage source converter.
  - Non- insulated current source converter.

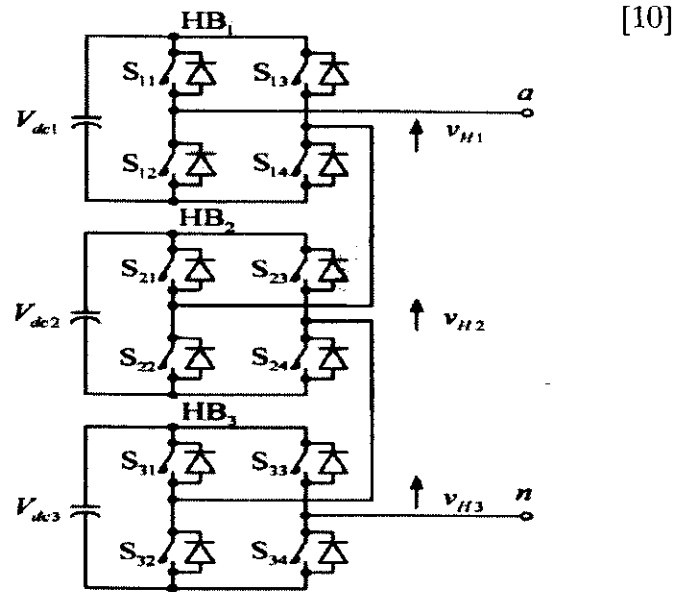
**Question (5)**

(20Marks)

- (a) In the circuit shown, explain how the switches can be operated to achieve the five level voltage across  $a$  and  $n$  and the voltage rating of each diode and switch.



- (b) Explain the operation of this multilevel inverter to obtain 15-levels. Sketch the output voltage of each bridge and  $V_{an}$ . Then explain briefly how this circuit can be operated to obtain 27-levels



انتهت الأسئلة مع تمنياتي بالتوفيق  
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