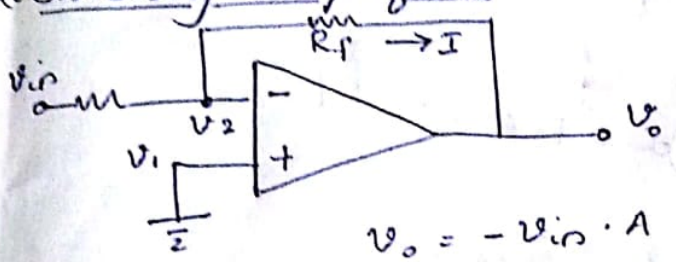
SOLUTION

Sub:- Industrial Electronics
Sem / Branch:- Sem IV / Mech & Auto / CBCGS
Date of Exam:- 23/05/2018

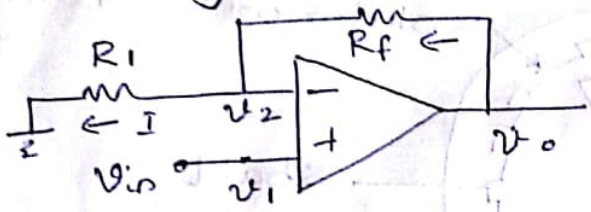
Q1.

(a) (i) Inverting Amplifier [2.5M]



$V_o = -V_{in} \cdot A$ where $|A| = \frac{R_f}{R_1}$

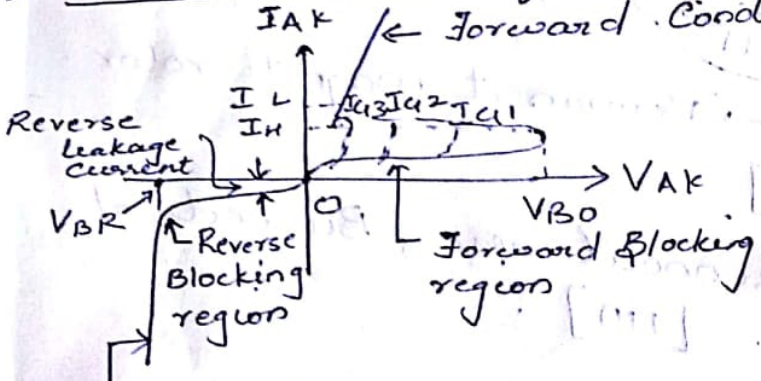
(ii) Non-inverting Amplifier [2.5M]



$V_o = V_{in} \cdot A$

where $|A| = 1 + \frac{R_f}{R_1}$

(b) VI characteristics of SCR [2M]



[1.5M]

Holding Current :- Minimum value of current required to hold the conduction of the device

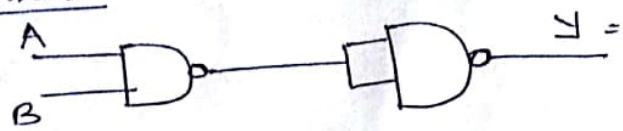
Latching Current :- Minimum value of current [1.5M] required to latch the device from its OFF state to ON state

(c) Basic Gates Using NAND Gates

(i) NOT

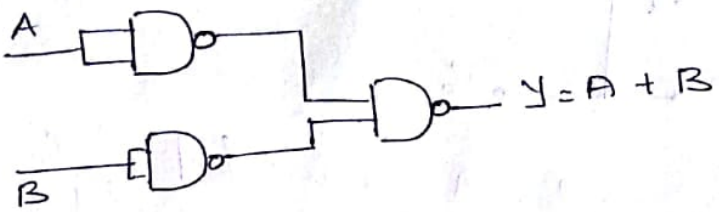
[1M]

(ii) AND



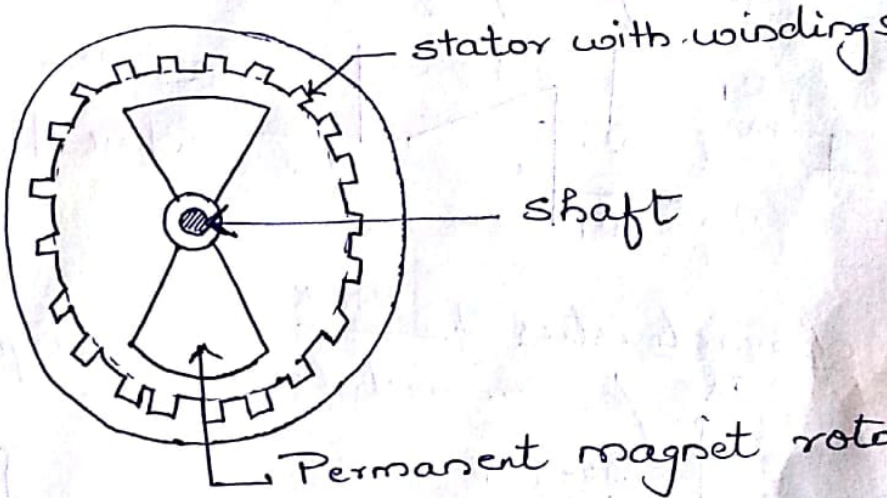
[2M]

(iii) OR



[2M]

(d) BLDC motor :- Brushless DC motor.



[2M]

Explanation :- [2M]

Applications :- Airconditioners, Biomedical instrumentation. [1M].

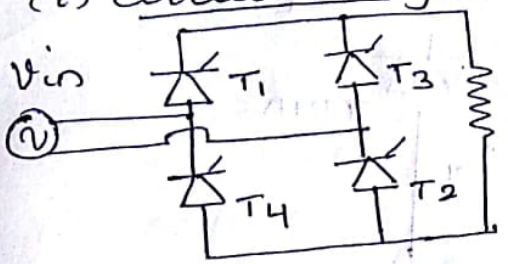
(e) [5M] for any 5 points of comparison.

Microprocessor	Microcontroller
(i) Integrates a number of useful fns. into a single IC package.	(i) Integrates a no. of the components of a microprocessor system onto a single chip.
(ii) Doesnot have built-in I/O operations, event timing, enabling & setting up priority levels for interrupts.	(ii) It has built-in I/O operations event timing, enabling and setting up priority levels for interrupts
(iii) Clock rate very fast	(iii) Relatively slow clock rate
(iv) Expensive	(iv) Cheap

Q2.

(a) Full wave Fully Controlled Rectifier :-

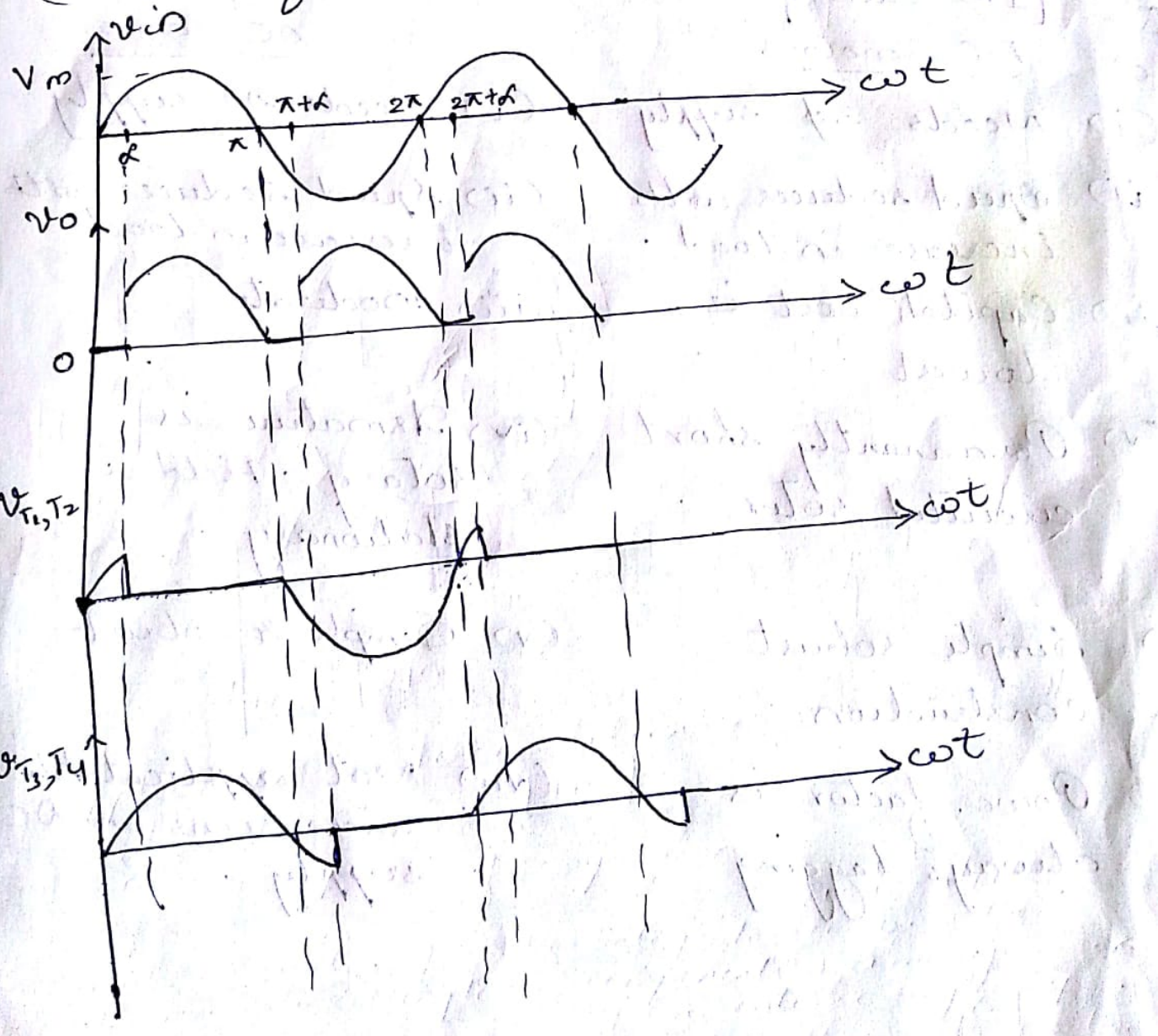
(i) Circuit diagram



[2M]

(ii) Explanation of working [2.5M]

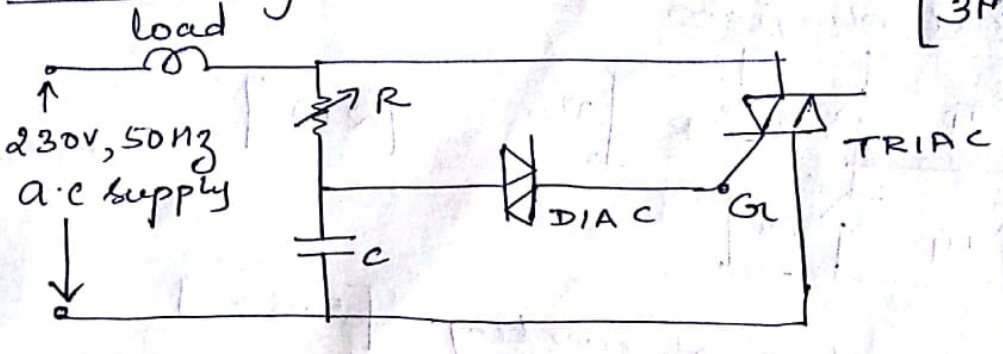
(iii) Waveforms [2.5M]



Q2:

(b) DIAC - TRIAC pair for illumination control

(i) Circuit diagram [3M]



(ii) Explanation [4M]

Q2: [1M Each point]

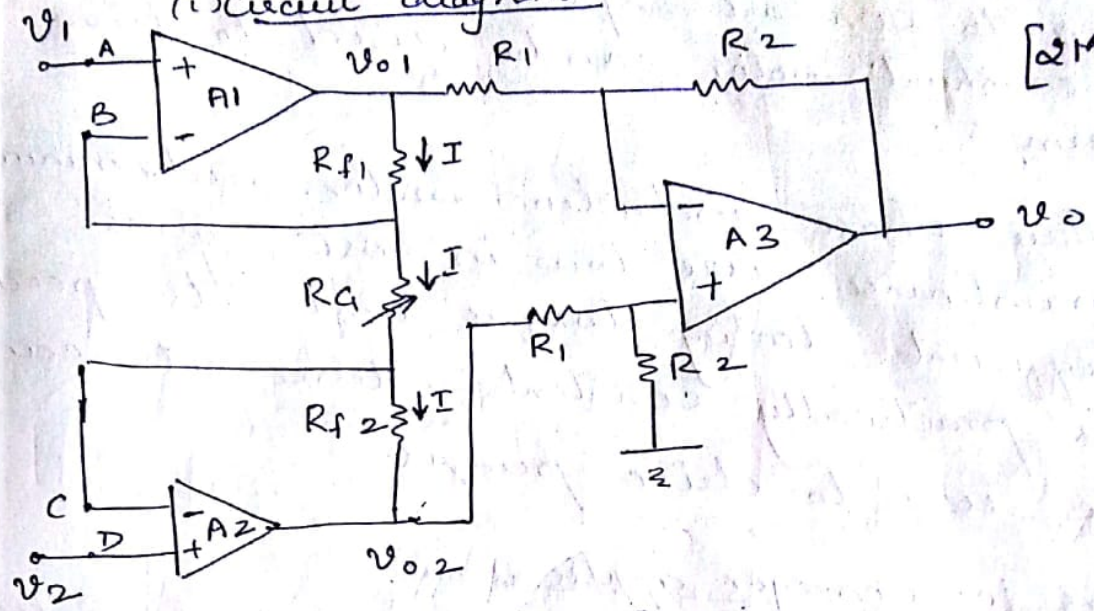
(c)

AC motors	DC motors
(i) Needs 3ϕ supply	(i) Needs DC supply
(ii) Speed reduces with increase in load.	(ii) Speed reduces with increase in load.
(iii) Capital cost is lowest	(iii) Moderate
(iv) Permanently short circuited rotor	(iv) Armature is rotary. Field is stationary
(v) Simple robust construction	(v) Simple & robust
(vi) Power factor is always lagging	(vii) Not applicable since runs on DC supply.

Q3.

(a) Instrumentation Amplifier

(i) Circuit diagram



[2M]

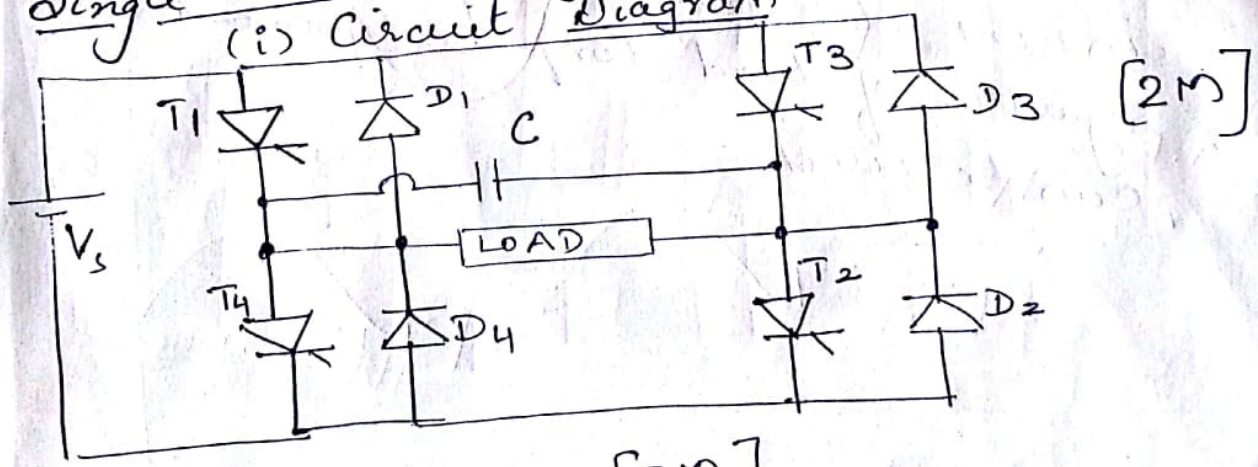
(ii) Explanation [3M]

(iii) Applications :- DAS, temperature control systems, light intensity meter, analog weigh scale etc. [2M]

Q3.

(b) Single Phase bridge inverter ckt.

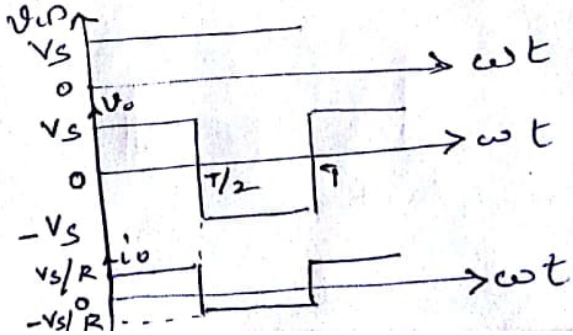
(i) Circuit Diagram



[2M]

(ii) Explanation [3M]

(iii) Waveforms



[2M]

Q3. [1.5 M Each]

(c) Motors for medium power pumps :-

(i) Due to constant speed characteristics, d.c shunt motor can be used to drive pumps.

(ii) Three phase induction motors needs minimum maintenance, are low in cost, gives sufficient starting torque and its speed is practically constant. Hence it can be used to drive pumps.

Motors for Conveyor applications :-

(i) For conveyors where speed control is needed during operation, a.c induction motors or BLDC motors can be used as they offer wide speed range and a constant torque regardless of speed.

(ii) ~~For motors~~ ~~which~~ For conveyors where the motor needs to be operated continuously in one direction at synchronous speed regardless of load torque, synchronous motors can be used.

Q.4

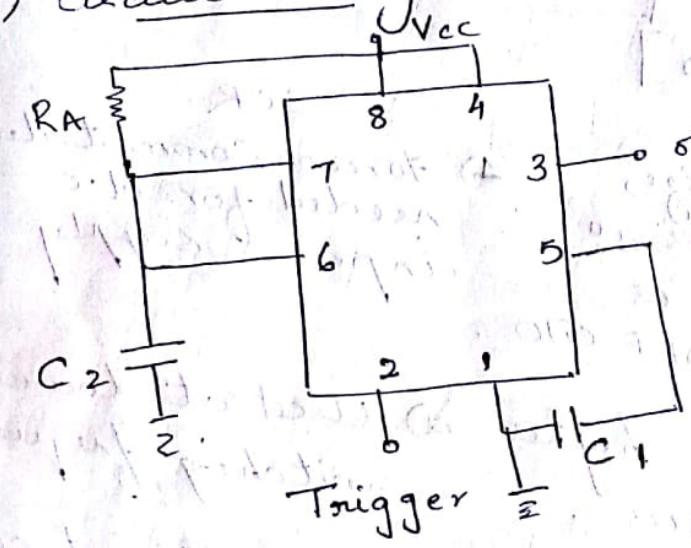
(a) Applications of microcontrollers :- [As mentioned in syllabus] [2M]

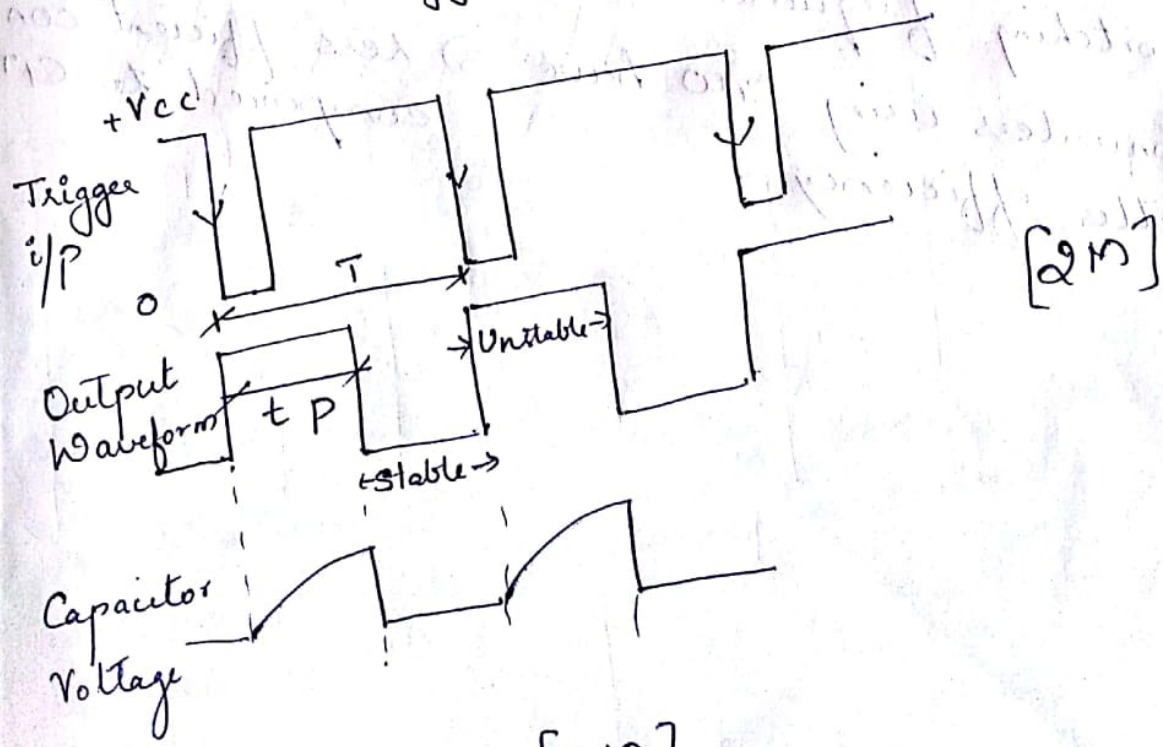
(i) Temperature measurement.
(ii) Proximity sensor for speed measurement
(iii) Piezoelectric Actuator Drive.

Explain any one : [5M]

(b) IC555 Timer as monostable multivibrator

(i) Circuit diagram [2M]





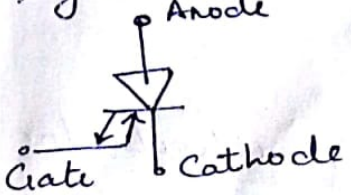
[2M]

Explanation :- [3M]

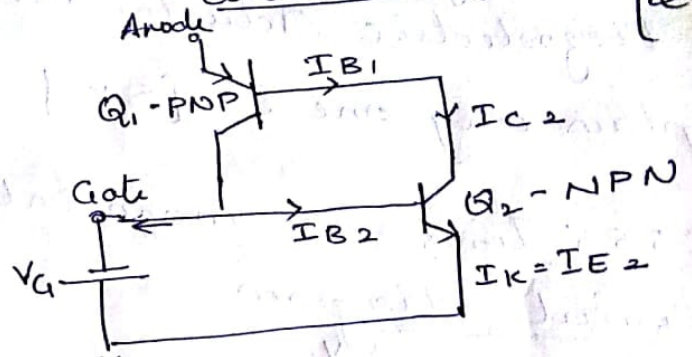
(c) GTO :- Gate Turn Off :

It is a special type of SCR which can be turned off by using a negative gate current pulse.

Symbol :



Circuit diag : [2M]



Explanation [2M]

Comparison [2M]

GTO	SCR
1) Reduction in size, weight & cost as no commutation ckt is needed to turn OFF GTO.	1) Forced commutation needed for d.c input supply.
2) Can be used at higher switching frequencies.	2) Used at lower switching frequencies
3) Converters using GTO have better efficiency.	3) Less efficient converters compared to GTO.

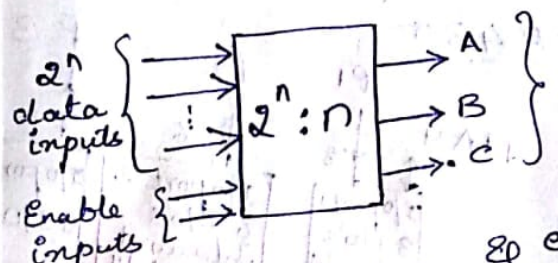
Q5.

(a) Commutation methods of SCR. [2M]

- Natural Commutation
- Forced Commutation
  - Current Commutation
  - Voltage Commutation

Explain any one :- [5M]

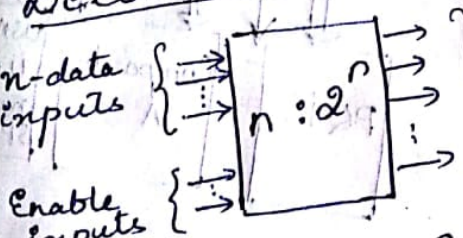
(b) Encoder in digital circuits



Block diagram & explanation :- [2M]

Applications :- Decimal to BCD encoder, Octal to binary encoder. Any application explained in detail :- [1.5M]

Decoder in digital circuits

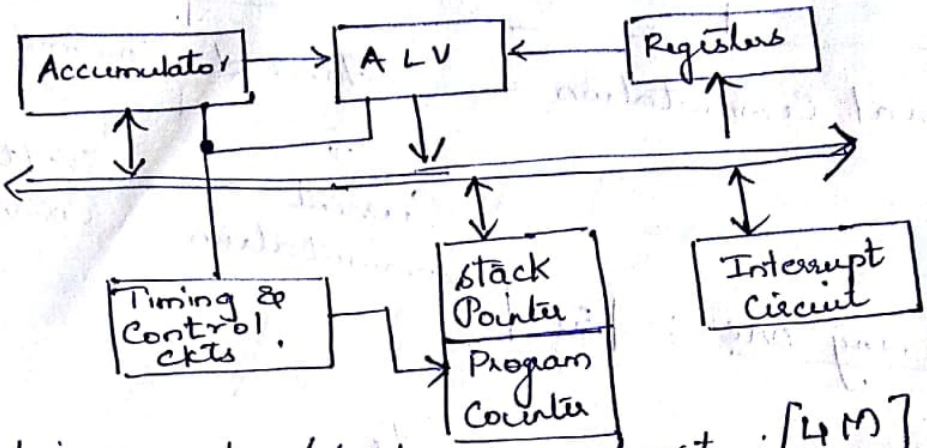


Block diag. & explanation :- [2M]

Applications :- Code converters, BCD to 7-segment decoder. Any application explained in detail [1.5M]

Q5:

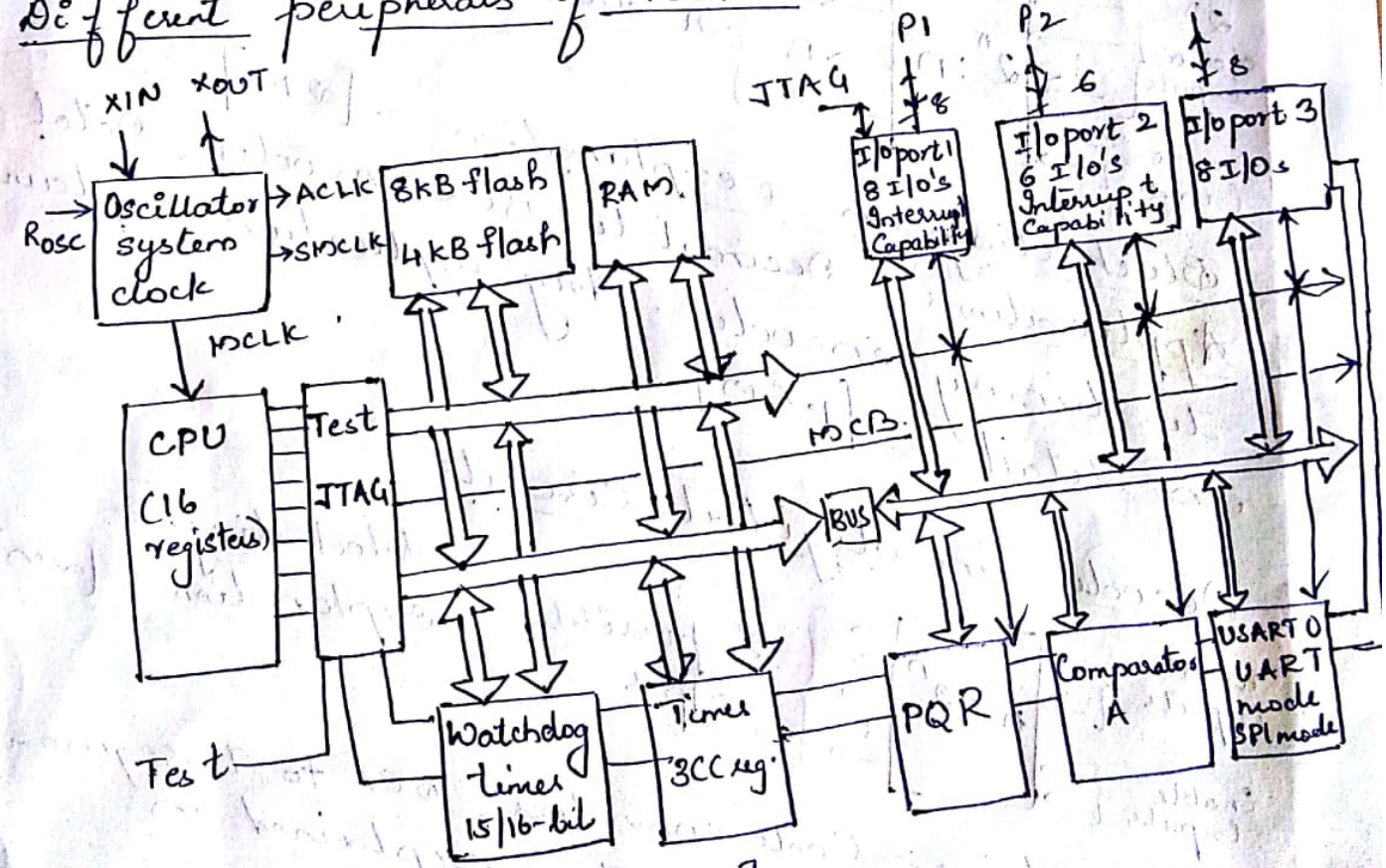
(c) Overview of a generic microprocessor



Explain each block in short : [4M]

Q6:

a) Different peripherals of MSP430



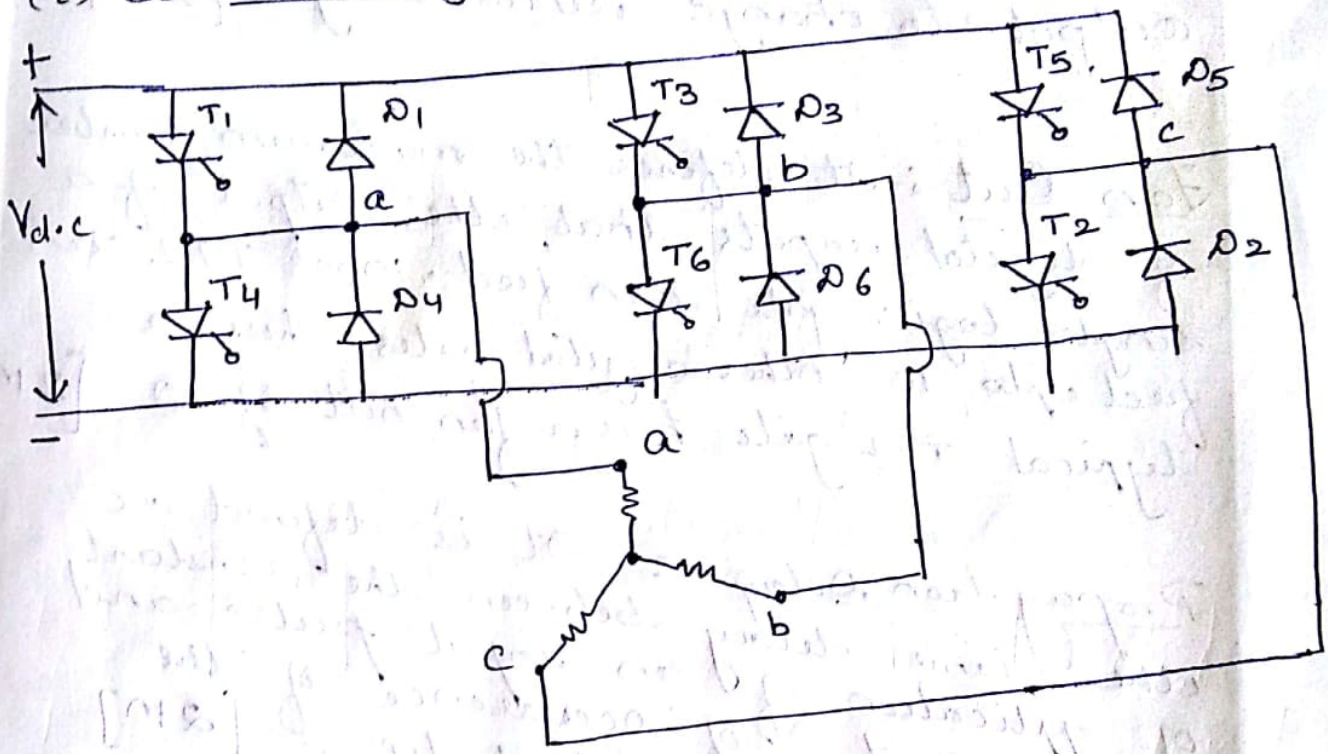
Block Diagram :- [3 Marks]

Explanation :- [4 M]

Q6.

(b) 180° mode of conduction for 3φ bridge inverter ckt.

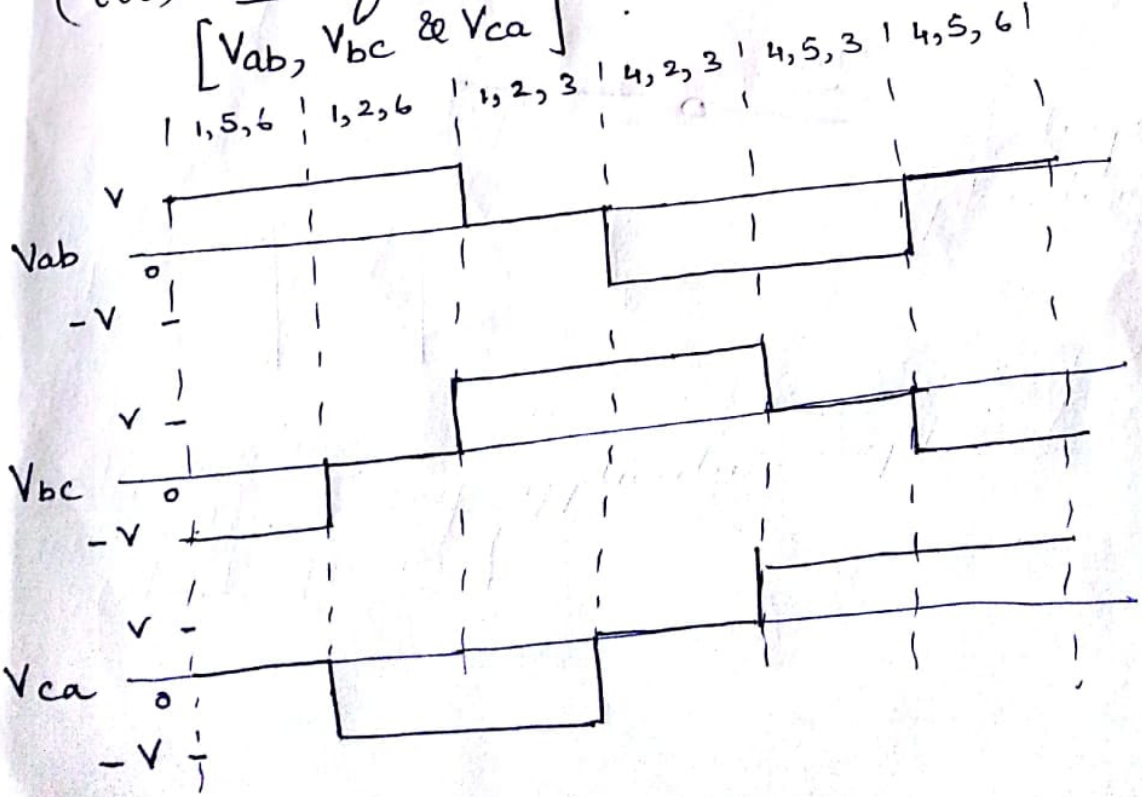
(i) Circuit diagram :- [2M]



(ii) Explanation :- [3M]

(iii) Waveforms :- [2M]

[Vab, Vbc & Vca]



Q6:

(c) Noise Immunity :- Ability of a logic circuit to tolerate the noise without causing the output to change undesirably. [2M]

Fan Out :- It defines the maximum number of digital inputs that the output of a single logic gate can feed. Most TTL can feed upto 10 other digital gates. Thus, a typical TTL gate has a fan-out of 10. [2M]

Propagation Delay :- It is defined as the time delay between the instant of application of an input pulse and the instant of occurrence of the corresponding output pulse. [2M]

—o—