



**UNIVERSITY OF CALICUT**

**Abstract**

BVoc programme in Automobile Auto Electricals & Electronics- under Modified BVoc Regulations 2014 – Question Bank - 3rd and 4th Semesters-implemented w.e.f 2014 admission onwards - Orders issued

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**G & A - IV - J**

U.O.No. 11183/2016/Admn

Dated, Calicut University.P.O, 20.09.2016

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*Read:-*1) U.O.No. 9483/2015/Admn Dt 16.09.16

- 2) Question Bank forwarded by the Chairman, BOS in Electronics
- 3) Remarks of the Dean, Faculty of Science 31.08.16
- 4) Orders of Vice Chancellor in the File 16.09.16

**ORDER**

As per the paper read as (1) Question Bank of 1st and 2nd Semesters of BVoc programme in Automobile Auto Electricals & Electronics has been implemented.

Vide paper read as (2) the Question Bank of 3rd and 4th Semesters of Automobile Auto Electricals & Electronics has been approved and forwarded by the Chairman, BOS in Electronics. As per paper read as (3) the Dean Faculty of Science has recommended to approve the Question Bank. Considering the urgency the Vice Chancellor exercising the powers of the Academic Council has approved to implement the Question Bank of BVoc in Automobile Auto Electricals & Electronics subject to the ratification of Academic Council.

Sanction has, therefore, been accorded for the implementation of the Question Bank of the 3rd and 4th Semester of the BVoc programme in Automobile Auto Electricals & Electronics, w.e.f 2014 Admissions.

Orders are issued accordingly.

Sumathi E.K  
Assistant Registrar

To

Principals of Colleges having BVoc Programmes  
CE, JCEs, Pareekshabhavan  
Digital Wing

Forwarded / By Order

Section Officer

# **SDC3AE09 - INSTRUMENTATION FOR AUTOMOBILE ENGINEERS**

## **COURSE OUTLINE**

### **Unit I - TRANSISTOR & ITS BIASING (15 hours)**

Transistor Symbols – Transistor as an Amplifier– Connections– CB, CE,&CC–Characteristics– Comparison of Transistor Connection. Transistor biasing: Methods of transistor Biasing– Base resistor method– Biasing with feedback resistor– Voltage divider bias method.

### **Unit II - JFET, MOSFET, SCR & UJT (10 hours)**

JFET – JFET as an Amplifier and its Output Characteristics –JFET Applications– MOSFET Working Principles, SCR – Equivalent Circuit and V-I Characteristics. SCR as a Half wave and full wave rectifier– Application of SCR, UJT– Equivalent Circuit of a UJT and its Characteristics.

### **Unit III - MEASUREMENT SYSTEM (10 hours)**

Methods of Measurements, Classification of Instruments and application, Static and Dynamic Characteristics of an Instruments, Errors in Measurement Systems– Units, System, Dimension and standards.

#### **Unit IV - PRIMARY SENSING ELEMENTS AND SIGNAL CONDITIONING (15 hours)**

Transducers and inverse transducers. Characteristics and Choice of transducers, Input, Transfer and output Characteristics and its application. Operational Amplifier, Characteristics of Operational Amplifier, Attenuator, Amplitude Modulation and Demodulation, Basic Filters, A/D Converters.

#### **Unit V - AUTOMOTIVE SENSORS AND ACTUATORS (10 hours)**

Introduction, basic sensor arrangement, Types of sensors such as – oxygen sensors, coolant temperature, exhaust temperature, Crank angle position sensors -Fuel metering, vehicle speed sensor and detonation sensor -Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays.

#### **Unit I - TRANSISTOR & ITS BIASING**

##### **MCQ'S (One mark questions)**

1. Which biasing circuit is most extensively used?  
(a) Common base (b) Common Emitter (c) Common collector (d) None
2. Transistor was invented in?  
(a)1948 (b) 1928 (c) 1938 (d) 1945
3. The Q-Point in a voltage amplifier is selected in the middle of the active region because  
(a) It gives a distortion less output (b) The operating point then becomes very stable  
(c)The circuit then requires less number of resistors (d) It requires a small DC voltage.
4. Very thin and lightly doped region in transistor is?  
(a)Emitter (b) Base (c) Collector (d) None
5. The potential divider method of biasing is used in amplifiers to

- (a) Limit the input AC signal going to the base (b) Make the operating point almost independent of transistor characteristics (c) Reduce the base current (d) None of these
6. For a silicon transistor the value of  $V_{BE}$  will be
- (a) 0.7 (b) 0.8 (c) 0.5 (d) 0.3
7. The most popular biasing circuit is ..
- (a) Simplest bias circuit (b) fixed bias circuit (c) Voltage divider bias circuit (d) None of these
8. Select the odd one
- (a) Diode (b) BJT (c) FET (d) MOS FET
9. In a PNP transistor with normal bias
- (a) Only holes cross the collector junction (b) Only majority carrier cross the collector junction (c) Collector junction has a low resistance (d) The emitter junction is forward biased and the collector base junction reverse biased.
10. In a transistor with normal bias the emitter junction
- (a) Has high resistance (b) Has a low resistance (c) Is reverse biased (d) None of these
11. For a transistor action
- (a) The collector base junction must be forward biased (b) the base region must be very narrow (c) The base region must be N- type material (d) None of these
12. The main current crossing the collector junction in a normally biased NPN transistor is
- (a) diffusion current (b) drift current (c) hole current (d) Equal to the base current
13. The current  $I_{CBO}$  flows in
- (a) The emitter, base and collector leads (b) The emitter and base leads (c) The emitter and collector leads (d) The collector and the base leads
14. A small increase in the collector reverse bias will cause
- (a) A large increase in emitter current (b) a large increase in collector current (c) Very small change in collector reverse saturation current (d) None of these
15. Compared to CB amplifier, CE amplifier has
- (a) Lower input resistance (b) Higher output resistance (c) Lower current amplification (d) Higher current amplification

16. The input and output signal of a common emitter amplifier are

(a) always equal (b) out of phase (c) always negative (d) in phase

17. A transistor is said to be in quiescent state when

(a) No signal is applied to input (b) It is unbiased (c) No currents are flowing (d) None of these

18. Select the current gain factor of CB transistor configuration among the following

(a) 100 (b) 200 (c) 0.5 (d) 0.95

19. Among the following which one is the most extensively used transistor configuration?

(a) Common base (b) common emitter (c) common collector (d) none of these

20. Odd one out

(a) Q-point (b) Quiescent condition (c) Operating point (d) Optimum power

### **Two mark Questions**

1. Why we bias a transistor?

2. Name the different biasing circuits.

3. Draw the structure of NPN, PNP transistors with their symbols.

4. Draw the schematic diagram for different Transistor configuration.

5. Dc current gain of transistor in CE configuration is 100. Find dc current gain in CB configuration.

6. Why CE configuration is most extensively used?

7. In a certain transistor emitter current of 1mA produces a change in collector current of 0.99 mA. Determine the current gain of the transistor.

8. What you mean by operating Point?

9. Draw the simplest biasing circuit.

10. Explain the term diffusion current?

11. Explain the term DC Alpha?

12. What do you mean by collector leakage current?
13. Note the saturation region in a common output characteristic curve in CE configuration?
14. Draw an NPN transistor connected in common collector configuration.
15. Explain why an ordinary junction transistor is called bipolar?
16. What are the input and output terminals in CE configurations?

### **Four mark Questions**

2. Explain the quiescent condition of a transistor?
3. Explain the Q-point condition of a transistor?
4. For a certain transistor common base current gain is 0.98 and emitter current is 2mA. Calculate the values of collector current and base current
5. The collector current is 2.9mA. If the base current is  $100\mu\text{A}$ , calculate CB current gain factor?
6. Explain relationship between different current in transistor.
7. A certain transistor is having  $\alpha_{dc}$  of 0.98 and collector leakage current  $1\mu$ . Calculate the base collector and base currents. When its emitter current is 1mA.
8. When Emitter current of a transistor is changed by 1 mA, its collector current changes by 0.995mA Calculate (a) Its CB current gain  $\alpha$  (b) Its CE current gain  $\beta$ .
9. Draw and explain fixed biasing circuit.
10. Find the Q point in Collector to Base Bias circuit if the resistor used is 500, 500000 ohms with a gain of 100
11. Establish a relationship between different transistor currents by drawing the electron flow diagram?
12. Explain the working of a transistor?
13. Draw and explain the circuit arrangement for PNP transistor in CB configuration?
14. Draw and explain the circuit arrangement for NPN transistor in CB configuration?

15. Draw and explain the circuit arrangement for PNP transistor in CE configuration?
16. Draw and explain the circuit arrangement for NPN transistor in CE configuration?
17. Draw and explain sample input and output characteristics for a PNP silicon transistor?
18. Explain the steps and procedures to find dynamic input resistance of the transistor at a given voltage?
19. Common emitter configuration is the most widely used amplifier circuit. Discuss.

### **Fifteen mark Questions**

20. Explain input and output characteristics of different transistor configurations in detail?
21. Explain Input and Output Characteristics CB and CE configurations.
22. Explain the procedures to obtain the Q-point of a given transistor in CB configuration?
23. Explain the requirements of biasing circuit and list out the different biasing circuits in detail?
24. (a) Compare each parameter of Different transistor configuration  
b) Compare different transistor biasing circuits?
25. Explain Collector to base Bias circuit, Voltage Divider bias circuit with diagram and voltage equations.
26. How  $\beta$  is related to  $\alpha$ ? Compare each parameter of Different transistor configuration.
27. (a) Explain Amplifying action of transistor -----8mark  
(b) Explain the relationship between transistor currents? -----7mark

## Unit II - JFET, MOSFET, SCR & UJT

### MCQ'S (One mark questions)

1. JFET terminal "legs" are connections to the drain, the gate, and the  
(a) channel (b) source (c) substrate (d) cathode
2. A junction field effect transistor is having how many diodes  
(a) 1 (b) 2 (c) 3 (d) 4
3. A MOSFET has how many terminals?  
(a) 2 or 3 (b) 3 (c) 4 (d) 3 or 4
4. JFET terminal "legs" are connections to the drain, the gate, and the .  
(a)channel (b) source (c) substrate (d) cathode
5. The input impedance of a MOSFET is  
(a) Less than FET but more than BJT (b) More than that of FET and BJT (c) More than FET but less than BJT (d) Less than FET and BJT
6. MOSFET uses the electric field of  
(a)Gate capacitance to control the channel current (b) Barrier potential of PN junction to control the channel (c) Both (a) and (b) (d)None of these
7. A depletion MOSFET differs from JFET in the sense that has no  
(a)channel (b) gate (c) PN junction (d) substrate
8. The extremely high input impedance of MOSFET is primarily due to  
(a) Absence of its channel (b) Negative gate source voltage (c) Depletion of electric current carrier (d) Extremely small leakage electric current of its gate capacity
9. What does the MOS stands for  
(a)Metal oxide silicon (b) Metal oxide semiconductor (c) Metal on silicon (d) None of these
10. Which of the following is expected to have highest input impedance  
(a)MOSFET (b) JFET amplifier (c) CE bipolar transistor (d) Common collector bipolar transistor
11. The transit time of the electric current carriers through the channel of a JFET decides it's ..... characteristics.

(a) Source (b) drain (c) gate (d) source and drain

12. SCR is a.....device

(a) Semi controlled (b) fully controlled (c) uncontrolled (d) none of the above

13. . In order for a BJT to conduct under the conditions of no signal input, the bias must be

(a) In the reverse direction at the E-B junction, sufficient to cause forward break over. (b) In the reverse direction at the E-B junction, but not sufficient to cause avalanche effect.

(c) Such that the application of a signal would cause the transistor to go into a state of cutoff.

(d) Such that the application of a signal would cause the transistor to go into a state of saturation.

14. . You need to design a relaxation oscillator circuit. The most likely device to use might be

(a) AN SCR. (b) A UJT. (c) a triac. (d) a 4-layer diode.

15.. Which of the following is fastest switching device.

(a)JFET (b)MOSFET (c) UJT (d)TRIAC

### **Two mark Questions**

1. Explain the basic theory of FET.

2. What is mean by Pinch off voltage?

3. What are the 4 leads of a junction transistor and also explain functions of each leads.

4. Why bipolar junctions are so called.

5. What are the different operating regions of BJT?

6. Draw the symbols of UJT, FET, and MOSFET.

7. write down the advantages of MOSFET

8. Plot VI characteristics of MOSFET

9. What is body effect.

10.What is the difference between SCR and a Triac.

11.What are the applications of SCR.

12. What is UJT ?

### **Four mark Questions**

1. Explain UJT.
2. Compare UJT and FET.
3. Explain the working of FET using Static Characteristic graph.
4. Explain MOSFET and how is it differ from a normal FET.
5. List down and explain the different applications of JFET
6. Draw the Equivalent Circuit of a SCR.
7. Explain about V-I Characteristics of a SCR.
8. How a SCR effectively uses Half wave and full wave rectifier
9. Explain the different applications of a SCR.
10. Draw and Explain the Equivalent Circuit of a UJT and its Characteristics.
11. Explain Output Characteristics of a JFET.
12. Explain the constructional regions of MOSFET.
13. What are the Applications of UJT.
14. Explain characteristics of UJT.
15. How does a SCR Power controller work?

### **Fifteen mark Questions**

1. Explain junction transistor explain its classification in detail.
2. Explain the output characteristics of a JFET, and also explain how it is effectively used as Amplifier.
3. (a) Explain the working of MOSFET.....(6)  
(b) Explain the output characteristics of UJT.....(9)
4. Explain VI characteristics of SCR, also explain its characteristics.

### **Unit III - MEASUREMENT SYSTEM MCQ'S (One mark questions)**

1. The science of measurement is called.....
2. Unknown quantity compare directly with known quantity in .....method.
  - (a)In direct method (b)Super direct method (c) Direct method (d)Sub-direct method
3. Gauge blocks are specified by its.
  - (a)Length (b) Breadth (c) Area (d) Height
4. Counting lines between the co-incident line is used in .....method.
5. Micrometer and Vernier Caliper are the examples of.....method.
6. Least measurement can distinguish by human eye is.....mm
  - (a)0.5 (b)0.15 (c) 0.25(d)0.35
7. Weight measurement using known weight is an example for .....comparison method.
8. Human capability extension using for measurement purpose is called.....
9. Order of response mechanical measuring instrument is.....
10. Order of response for electrical equipment is.....seconds.
  - (a)0.5 (b)2.4 (c) 24 (d)0.2 s
11. Maximum limit of a glass thermometer is found to be 100 Celsius find its range when room temperature is 25 Celsius.
  - (a)100 (b)75 (c) 25 (d)None
12. Unit of sensitivity for a glass thermometer will be.....
13. Unit of sensitivity for a Pressure transducer will be.....
14. ....is the final measure of energy consumed in a energy meter.
  - (a)Input Current (b)Input Voltage (c) Output Voltage (d)Output Current
15. ....type magnets are used in Galvanometer.
16. Bending of tube while pressure acting on it this property used in.....type pressure
17. Metal used in RTD is having .....thermal co-efficient
18. Metal used in Thermistor is having .....thermal co-efficient
19. Dimension of work is .....
20. Note down SI Unit of Power?

## Two mark Questions

1. Define measurement ?
2. Define measurand?
3. Explain Direct method ?
4. Explain Line method ?
5. Draw and explain Slip gauges ?
6. Draw and explain Gauge block ?
7. Explain the end standard method?
8. Explain fundamental method?
9. Explain Comparison method?
10. Define the term Measuring Instruments.
11. Define the term mechanical measuring instruments
12. What you mean by Electronic measuring instrument
13. What you mean by secondary instrument
14. Explain brief about deflection type instruments
15. Explain brief about null type instruments
16. Explain why the self operating equipments are so called.
17. List down the performance characteristics of measuring instruments.
18. What you mean by linearity.
19. What you mean by Sensitivity drift.
20. Define error

## Four mark Questions

1. Define measurement and factors needed for meaningful measurement system.
2. Explain the need of Instrumentation for Automobile engineers.
3. Describe the methods of Measurements'.
4. Explain about gauge blocks and how it is effectively employed for measurement purposes?
5. Explain line method, end method End method and their combination method.
6. Explain absolute method and comparison method.
7. Explain interpolation/Extrapolation method and also explain how the method using for measurement.
8. Define measuring instrument and classify them.
9. Classify and explain mechanical, electrical measuring instruments, give examples for each.
10. Write and explain primary measuring instruments.
11. Differentiate deflection and null type instruments.
12. Write a short note on performance characteristics of measuring instruments.
13. Explain the term Range, Sensitivity, Linearity.
14. Explain the term Sensitivity, Linearity, hysteresis.
15. What you mean by dynamic characteristics of measuring instruments.
16. Explain the principle of Bourden tube pressure gauge.
17. Explain the principle of Galvanometer.
18. Explain the working of RTD and Thermistor.
19. Define the following terms: Static error, gross error, Environmental error.
20. Obtain the dimension of any five electrical/mechanical quantities.

## Fifteen mark Questions

1.Explain the need of measurement for automobile engineers and also explain methods of measurement.

2.Classify and list out various measuring instruments in-detail

3.(a) Write a note measurement system.....(8)

(b)Write a note on Units and Dimension.....(7)

#### **Unit IV - PRIMARY SENSING ELEMENTS AND SIGNAL CONDITIONING**

#### **MCQ'S (One mark questions)**

1. Device used to convert one form energy in to another are called.....

,2. An inverse transducer converts .....energy in to any other form of energy.

3. Pressure transducer for measuring blood pressure is

(a) Strain gauge transducer only (b) Strain gauge or capacitive transducer

(c) Resistive transducer (d) Fiber optic transducer

4. One of the following is an active transducer/

(a)Strain gauge (b)Selsyn (c) photovoltaic cell (d)Photo emissive cell

5. A resistance potentiometer is a.....

(a)first order instruments (b)zero order instruments

(c) second order instruments (d)none of these

6. Thermocouples are .....

(a)Passive transducer (b) Active transducer (c) Both of these (d)Output transducers

7. Piezo-electric transducers are.....

(a) Passive transducer (b) Active transducer (c) Inverse transducer (d)both b and c

8. Capacitive transducers are generally used for measuring.

(a)Static measurements (b) Dynamic measurements (c) transient measurements (d)Both a and b

9. A Hall Effect transducer can be used for measurement of.....

10. IC 741 is code name for .....

11. Input impedance of an Ideal operational amplifier is...

12. Which of the following statements is correct?

(a) Actuators and transducers are both examples of sensors (b) Sensors and transducers are both examples of actuators. (c) Sensors and actuators are both examples of transducers.

(d)None of theses

13. Open loop gain of an Ideal operational amplifier is...

14. In ..... transmission the carrier signal is modulated so that its amplitude varies with the changing amplitudes of the modulating signal  
 (a) IS (b) FM (c) PM (d) None of these
15. The process of superimposing AF or VF wave with a high frequency carrier is called  
 (a) Interference (b) diffraction (c) modulation (d) Demodulation
16. The typical value of input offset voltage of a 741OPAMP is .....
17. The typical value of input offset Current of a 741OPAMP is .....
18. A transducer in a measurement system is the.....  
 (a) Signal conditioning device (b) Input element (c) Output Element (d) Processing device
19. .... cannot be used to measure Pressure.  
 (a) Strain gauge (b) Pyrometer (c) LVDT (d) Pirani gauge
20. A differential transducer is a ..... transducer  
 (a) Constant Pressure (b) Constant displacement (c) Variable inductance (d) Variable Pressure

### **Two mark Questions**

1. List down the different types of electrical transducers.
2. Note down the main five broad classification of transducers.
3. List down the classification of variable inductance transducer.
4. Draw the diagram of a LVDT
5. What is the principle on which capacitive transducer works.
6. Define transducer, List out its functions.
7. List out the main four advantages of Electromechanical strain gauges.
8. Draw the diagrammatic representation of Self generating variable inductance transducer.
9. Draw the diagrammatic representation of a mutual inductance transducer.
10. What you mean by Piezo-electric material ?
11. Draw the diagrammatic representation of a Piezo-electric transducer.
12. Name the common modulation technique employed for digital data transmission.
13. Classify types of filters.
14. Draw the Schematic diagram of an OPAMP
15. Draw the pin connection diagram of IC 741
16. Explain why we use analog & Digital converters in measurements systems.
17. Draw any type of demodulator.
19. Draw any type of input Amplitude modulator.
20. What you mean by an attenuator.

### **Four mark Questions**

1. List down the different types of electrical transducers with their principle of operation, Applications.
2. List down and explain the different factors influencing the choice of transducers.
3. How are transducers classified.

4. Describe thermistors and RTD
5. Give the classification of variable inductance transducer, Explain.
6. List down the different quantity to be measured and name different transducer for each quantities.
7. Explain about input and output characteristics of a transducer.
8. Draw and explain piezo-electric transducer.
9. Describe & classify filters.
10. Explain differentiator Op-Amp circuit, Integrator Op-Amp circuit.
11. Explain summing Op-Amp circuit, differentiator Op-Amp circuit
12. Explain about the transfer characteristics of an OPAMP
13. Explain the different modes of working of OPAMP
14. Explain Operational Amplifier Characteristics.
15. What are the different OPAMP circuits used in Instrumentation.
16. Classify attenuators, explain Resistance attenuator.
17. Explain the amplitude modulation briefly.
  
18. Draw and explain Input modulators.
19. Describe digital to analog converter with one method.
20. Describe analog to digital converter with one method.

### **Fifteen mark Questions**

1. Explain differentiator, Integrator, summing Op-Amp circuits in -detail.
2. Classify different types of transducer according to several factors, explain any two of them.
3. Explain with diagrams important transducer actuating mechanism.
4. Explain Amplitude modulation and de-modulation of a sinusoidal signal.
5. Describe analog to digital and digital to analog conversion with one method.
6. (a) Describe & classify filters. Derive an expression for its transfer function.(10)  
(b) Describe analog to digital with one method.

### **Unit V - AUTOMOTIVE SENSORS AND ACTUATORS (10 hours)**

#### **MCQ'S (One mark questions)**

1. Fuel Injectors are electronically controlled.....

(a)Sensors (b)Actuators (c) Both of these (d) None of these

2. If lambda is greater than one the mixture is said to be.....
3. ....is the most commonly used exhaust gas oxygen sensor.
- 4.....metal plate is used in ZrO<sub>2</sub> EGO sensor.
5. Magnitude of voltage produced is changes with the concentration of .....gas
6. EGO cannot be used under the temperature of .....Celsius  
(a)100 (b)200 (c) 300 (d)400
7. Knock Occurs in an SI engine mainly because of.....
8. Which one is most commonly used as mass air flow sensor?
9. Equivalence ratio is denoted by the letter .....
10. Acronym “ HEGO” represents.....
11. In MAF hot wire element is replaced by .....mounted on a substrate.
- 12.....no of Pulses were passing through meter in a fuel metering sensor.
13. Unlike the normal DC motor it doesn't have.....
14. ....is a electrically operated signal control signal switch used in automobiles.
15. If lambda is less than one the mixture is said to be.....

### Two mark Questions

- 1.What you mean by Sensors in control systems.
2. What you mean by Actuators in control systems.
- 3.Draw the block diagram sensors in control system application.
4. Draw the block diagram sensors in measurement application.
5. Draw the block diagram sensors in communication application.
- 6.Draw block diagram for engine control system.
- 7.List down any six variables to be measured in an automobile
8. Define equivalence ratio.
9. What are the types of exhaust gas used in EGO sensors used in automobiles?
- 10.Outside of ZrO<sub>2</sub> EGO sensor is exposed to exhaust gas while inside is exposed to .....
- 11.What are the different operating modes of EGO
- 12.Explain how the heating is achieved in HEGO.
- 13.What you mean by detonation/ Knock in an Engine?
14. Why should we detect Knock?

15. Draw the operational diagram of Mass-Air flow sensor.
16. Explain how wheat stone principle sensor is used in mass airflow sensor.
17. Can we use crankshaft position sensor to measure camshaft position explain?
18. Explain the basic idea of Hall Effect sensor.
19. Draw a diagram of Potentiometric Angle convertor.
20. What do you mean by fuel metering.
21. Explain the basic working of Relays.
22. Note down the operational fundamentals of a stepper motor.

### **Four mark Questions**

1. Draw and explain block diagram for engine control system.
2. List down and explain variables to be measured in an automobile
3. Write a note on Exhaust gas oxygen sensor.
4. Elaborate on exhaust gas oxygen sensor.
5. Write a note on ZrO<sub>2</sub> EGO sensor.
6. Draw and explain ZrO<sub>2</sub> EGO sensor using its diagram.
7. Explain the operation of HEGO Sensors.
8. Explain the working of Magnetostriction type knock sensor
9. Explain the working of Piezoelectric type Knock Sensor.
10. Explain weighted flap type mass air flow sensor using its diagram.
11. Write a note on crankshaft position sensor.
12. Explain Hall Effect crankshaft position sensor.
13. Write a short note on Engine speed sensor.
14. Write a note on throttle angle sensor.
15. Explain how a potentiometer is effectively used in Angle measurement.
16. Explain the working of a relay system using diagram.
17. Describe the working of a stepper motor.
18. Explain working of a solenoid valve using its diagram.
19. Explain the working principle of fuel metering sensor

### **Fifteen mark Questions**

1. Write a note on oxygen sensors, coolant temperature & exhaust temperature. Solenoids, stepper motors.
2. Explain Crank angle position sensors -Fuel metering, vehicle speed sensor in-detail.
3. Explain detonation sensor. Altitude sensor, flow sensor. Throttle position sensors in-detail.
4. Describe the basic sensor arrangement and write a note on stepper motors, relays.

## SDC3AE10 - CIRCUIT THEORY & POWER SYSTEMS

### MOD 1

1) Time constant in a network is.....

- a) Time taken by the voltage to reach 36.8% of its final value
- b) Time taken by the voltage to reach 50% of its final value
- c) Time taken by the voltage to reach 76.3% of its final value
- d) Time taken by the voltage to reach 63.2% of its final value

2) The steady state value of charging current in R L circuit excited by DC is

- a) 0
- b) infinite
- c)  $V/(2R)$
- d)  $V/(R)$

3) The discharging current in R L series circuit is

- a) exponentially rising function
- b) exponentially decaying function
- c) sinusoidally varying function
- d) sinusoidally varying exponentially decaying function

4) The charge stored in a capacitor is

- a) Directly proportional to current passing through it
- b) Directly proportional to distance between the plates of capacitor
- c) Directly proportional to voltage applied across it
- d) inversely proportional to voltage applied across it

5) A capacitor opposes sudden change in.....?

- a) current
- b) flux
- c) voltage
- d) resistance

An inductor opposes sudden change in.....?

- a) current
- b) flux
- c) voltage
- d) resistance

6) When current flowing through an inductor is constant, the voltage across it will be

- a) constant
- b) depends on the value of inductance
- c) depends on number of turns
- d) Zero

7) A fully charged ideal inductor is connected in parallel with an initially relaxed ideal capacitor. What is the nature of voltage across the combination?

a) exponentially decaying b) sinusoidal c) sinusoidal exponentially decaying d) dc with drooping characteristics

8) The technique employed for solving a 1000 node electrical network is

a) node analysis b) mesh analysis c) Kirchhoff's current law d) Graph theory

9) Branches of a tree in a network are called.....?

a) twigs b) Links c) nodes d) graph

10) Sub graph of a given graph where there is no closed path is called.....?

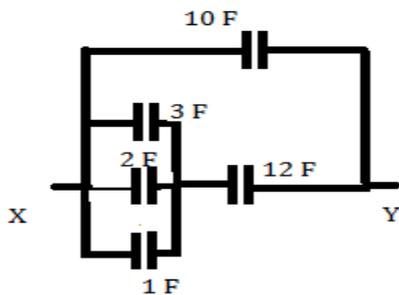
a) Tree b) Links c) twigs d) branch

### 2MARK

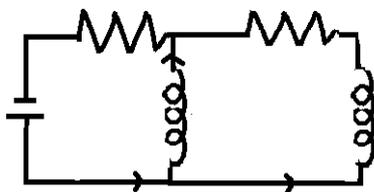
1) The voltage and current in a circuit element is  $v=100\cos(377t-80)$ ,  $i=10\cos(377t+10)$ . Identify the element and obtain its value?

2) The voltage and current in a circuit element is  $v=400\sin(314t-80)$ ,  $i=10\sin(314t-80)$ . Identify the element and obtain its value?

3) Find equivalent capacitance of the circuit across x-y



4) Draw the graph of the network shown? Obtain the bus incidence matrix assuming currents in the given graph?



5) What is the importance of Laplace transform in circuit analysis?

6) Define passive filter?

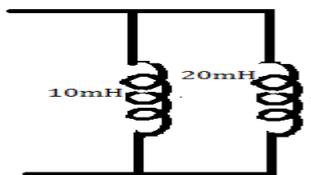
7) If a circuit is terminated with a load resistance equal to internal resistance, what is the peculiarity we can observe?

4 MARK

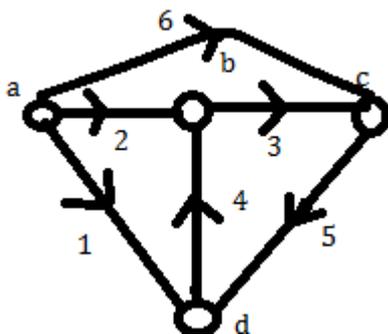
1) Find the current in a series R-L circuit having  $R=2\ \Omega$  and  $L=2\text{H}$  while a dc voltage of  $100\text{V}$  is applied. What is the value of this current after  $5\text{s}$  of switching on?.....

2) Calculate the time taken by a capacitor of  $1\mu\text{F}$  and in series with  $1\text{M}\Omega$  resistance to be charged up to  $80\%$  of the final value?

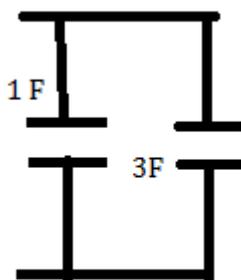
3) In fig a time varying voltage is applied. At any time instant, total current supplied by the source is  $25\text{A}$ . Obtain the value of instantaneous currents through each of the inductances?



4) Obtain incident matrix of the given graph and find number of trees possible in it?



5) In fig a time varying voltage is applied. At any time instant, total current supplied by the source is  $25\text{A}$ . Obtain the value of instantaneous currents through each of the capacitance?

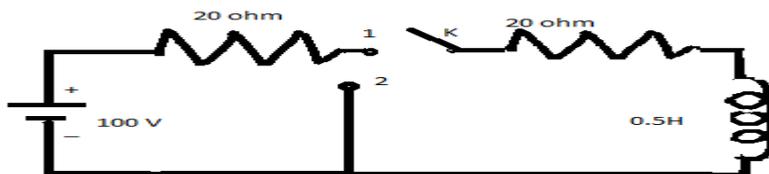


15 MARK

1) A series R-L circuit having  $R=25\ \Omega$  and  $L=5\text{H}$  while a dc voltage of 100V is applied. Find the equation for charging current, voltage across R and L and (b) the current in the circuit 0.5s later and

(c) the time at which the drop across R and L are same?

2) In fig switch k is kept first at position 1 and steady state condition is reached. At  $t=0$ , the switch is moved to position 2. Find the current in both cases? If the value of inductance is increased, what happens to the response? Explain?



3) a) A  $10\ \mu\text{F}$  capacitor is initially charged to 100V dc. It is then discharged through resistance  $R\ \Omega$  for 20s. When the potential difference across capacitor is 50V, Calculate the value of R?

b) Obtain the step response of R-L series circuit using laplace transform?

4) A 50 Hz sinusoidal voltage  $v=311\ \sin\ \omega t$  is applied to A R L series circuit. If the magnitude of resistance is  $5\ \Omega$  and that of inductance is 0.02H

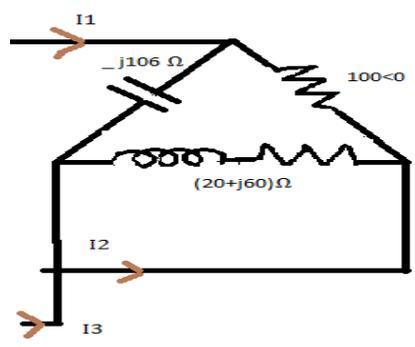
a) Calculate rms or effective value of steady state current and relative phase angle?

b) Obtain the expression for instantaneous current

c) Compute the effective magnitude and phase of voltage drop appearing across each circuit element

5) a) A 3 phase, star connected system with 400V (L-L) is connected to three loads.  $25\angle 0^\circ$ ,  $11\angle -20^\circ$  and  $15\angle 10^\circ\ \Omega$  in star. Find line current and current in the neutral of the system?

b) Find the phase currents and the line currents of the  $\Delta$  connected load provided the supply is a balanced 100V, 50Hz 3 phase supply?



## MOD 2

- 1) For studying load behavior .....theorem is used
  - a) Millman's theorem
  - b) Superposition theorem
  - c) Norton's theorem
  - d) Reciprocity theorem
- 2) In thevenin's equivalent circuit, if  $R_{th}=0$ , Load current=
  - a)  $V_{th}/R_{th}$
  - b)  $(V_{th}/R_{th})^2$
  - c) 0
  - d)  $V_{th}/R_{th}^2$
- 3) ..... is an example of bilateral element?
  - a) Diode
  - b) Transistor
  - c) FET
  - d) None of these
- 4) The maximum power transfer takes place in a network when
  - a)  $R_{th}=R_L^2$
  - b)  $R_{th}=R_L$
  - c)  $R_{th}+R_L =0$
  - d)  $R_{th} < R_L$
- 5) Superposition theorem has significance
  - a) only in network with one source
  - b) only in network with two source
  - c) only in network with more than one voltage source
  - d) only in network with more than one source
- 6) In thevenin's theorem, thevenin voltage is
  - a) Open circuit voltage across load
  - b) Short circuit voltage across load
  - c) Source voltage
  - d) Node voltage
- 7) Millman's theorem is applicable for
  - a) A circuit with a number of voltage source
  - b) A circuit with a number of current sources
  - c) A circuit with a number of sources
  - d) A circuit with a single source
- 8) Which among the following theorem is not related to circuit analysis?
  - a) Reciprocity theorem
  - b) Northend theorem
  - c) Millman's theorem
  - d) Thevenin's theorem
- 9) Thevenin's theorem can be applicable to
  - a) linear bilateral network
  - b) non linear non bilateral network
  - c) any network
  - d) none of these

10) Norton's theorem can be applicable to

a) linear bilateral network b) non linear non bilateral network c) any network d) none of these

2 MARK

1) Explain reciprocity theorem

2) What is the application of Millman's theorem?

3) Explain Tellegen's theorem?

4) Define pole and zero of a network?

5) Define Thevenin resistance

6) Define Norton current?

4 MARK

1) Find the value of load resistor for which maximum power transfer takes place in any network? Find

the value of this maximum power?

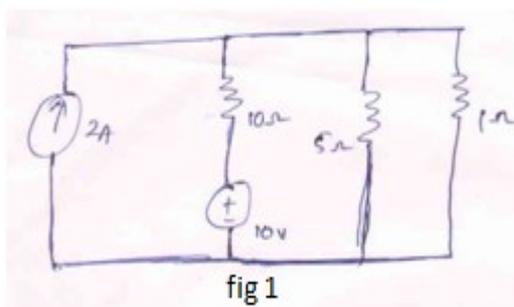
2) Explain Tellegen's theorem?

3) With suitable diagram, explain Thevenin's theorem?

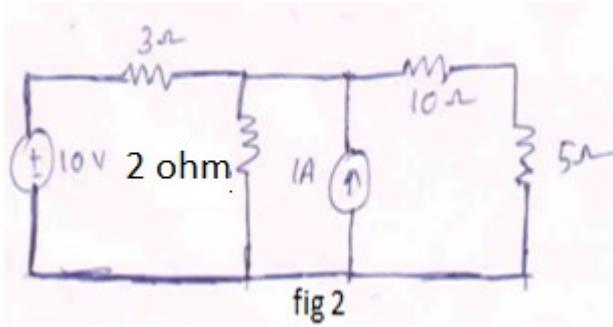
4) With suitable diagram, explain Norton's theorem?

15 MARK

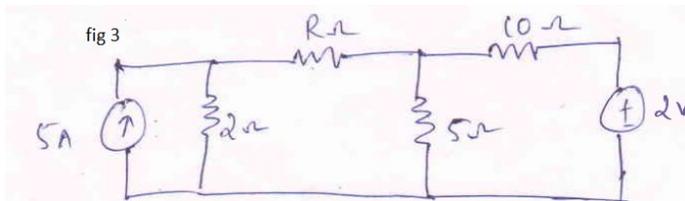
1) In the given circuit, find power loss in  $1\Omega$  resistor by Thevenin's theorem? (fig 1)



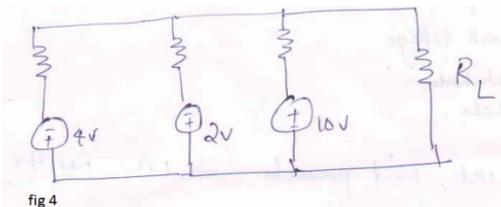
2) Find the current in  $5\Omega$  resistor using Norton's theorem? (fig 2)



3) What should be the value of  $R$  such that maximum power transfer can take place towards  $R$ ? (fig 3)



4) Using Millman's theorem, find the current through  $R_L$  in the circuit? verify the result using superposition theorem? ( $R_L = 3\Omega$ , Internal resistance of the battery =  $1\Omega$ ) (fig 4)



### **MOD 3**

1) Pallivasal power station is.....power station?

a)nuclear b)hydro electric c)thermal d)wind

2)The generating voltage in india is?

a)220 V b)1000 V c)11 KV d)110 KV

3)The industrial unit of electric energy is

a)KW b)A c)KWHr d)MWHr

4)The transmission voltage in india is?

a)220 V b)220KV c)11 KV d)1000 V

5)The rate at which electric energy is sold to consumers is called.....?

a)Cost b)incremental fuel cost c)Tariff d)load factor

6)Corona is seen in a conductor at a potential gradient of

a)11KV/cm b)30KV/cm c)1KV/m d)23KV/m

7)The fuel used in nuclear power station is?

a)Cadmium b)mendalivium c)Uranium d)hydrogen

8)Per day Average power demand in kerala is around

a)4500 MW b)3500 MW c)6000MW d)2000MW

9)Main disadvantage of electrical energy is

a)losses on transmission b)severity of electric shock c)storage problem  
d)atmospheric pollution and interference

10) power station used as Base load in india is

a)Thermal b)nuclear c)Hydro electric d)wind

### **2 MARK**

1)Give any 2 examples for conventional and non conventional energy sources?

2)Give any two suggestions to meet increasing energy demand with respect to current power scenario?

3)Why bundled conductors are used for power transmission?

4)What is the need of transposition of conductors for transmitting power?

### **4 MARK**

- 1) Write short note about present power scenario in India?
- 2) Differentiate between conventional and nonconventional energy sources?
- 3) Write short note on corona?
- 4) What is the need for transposition of conductors in a transmission line?
- 5) What are the factors affecting corona?
- 6) Explain about different bus bar arrangements in power system?
- 7) Explain different types of overhead line insulators?

15 MARK

1) The incremental cost characteristics of 2 generators delivering a total load of 200 MW are as follows.

$$d/dP_1(F_1) = 0.01P_1 + 2;$$

$$d/dP_1(F_2) = 0.02P_2 + 1.6.$$

What should be the values of  $P_1$  and  $P_2$  for economic operation?

2) A lossless power system has to serve a load of 250 MW. There are 2 generators  $G_1$  and  $G_2$  in the system with cost curves  $C_1$  and  $C_2$ .  $C_1 = P_{g1} + 0.055P_{g1}^2$ ,

$C_2 = 3P_{g2} + 0.03P_{g2}^2$ . Where  $P_{g1}$  and  $P_{g2}$  are MW injection from  $G_1$  and  $G_2$ . What will be the minimum cost dispatch?

3) Incremental fuel cost for a power plant consisting of 3 generating units are

a)  $Ic_1 = 20 + 0.3P_1$

b)  $Ic_2 = 30 + 0.4P_2$

c)  $Ic_3 = 30$ .

4) Assume that all the three units are operating all the time. Minimum and maximum load on each unit are 50 MW and 300 MW respectively. If the plant is operating on economic load dispatch to supply total power demand of 700 MW; calculate power generated by each unit?

5) A single phase a.c distributor AB 300 metres long is fed from end A and is loaded as under: (1) 100 A at 0.707 p.f lagging 200 m from point A (2) 200 A at 0.8 p.f lagging 300 m from point A

The load resistance and reactance of the distributor is  $0.2\Omega$  and  $0.1\Omega$  per kilometre. Calculate the total voltage drop in the distributor?

6) Draw and explain typical layout of an electrical power system?

## MOD 4

1) Most severe fault in electrical system is

a) line to line b) 3 line to ground fault c) Double line to ground d) line to line

2) Circuit breaker capacity is based on

a) line to line fault b) 3 line to ground fault c) Double line to ground fault d) line to line fault

3) The possibility of occurrence of line to line fault is

a) 5% b) 10% c) 15% d) 70%

4) The possibility of occurrence of 3 line to ground fault is

a) 5% b) 10% c) 15% d) 70%

5) The possibility of occurrence of Double line to ground fault

a) 5% b) 10% c) 15% d) 70%

6) The possibility of occurrence of line to ground fault is

a) 5% b) 10% c) 15% d) 70%

7) Symmetrical components are used for .....

a) power system protection b) asymmetrical fault analysis c) For both d) None of these

8)

### 2mark

1) What are the components of a power system?

2) Explain the advantage of per unit representation ?

3) What do you mean by Ferranti effect?

4) Derive the representation for base impedance in terms of base KVA and base KV.

5) Why fault occur in a power system?

6) For a fault at a given location rank the various faults in the order of severity?

7) What is the need of fault analysis?

8) How power factor affects consumers?

9) Name different types of insulators used in overhead lines?

10) What is the importance of Peterson coil in power system?

4 mark

- 1) Explain the importance of insulation coordination in a high voltage power system?
- 2) Explain the principle of lightning arrester?
- 3) With diagram explain rod gap arrester?
- 4) Differentiate between symmetrical and asymmetrical fault in a power system?
- 5) Write short notes about the methods employed for overvoltage protection in a power system?

15 mark

1) An overhead 3-phase transmission line delivers 5000KW at 22KV at 0.8 pf lagging. The resistance and reactance of each conductor is  $4\Omega$  and  $6\Omega$  respectively. Determine 1) sending end voltage 2) % regulation 3) Transmission efficiency

2) Define the terms voltage regulation and transmission efficiency? Explain the effect of load power factor on regulation and efficiency?

3) The single line diagram of an unloaded power system is shown in fig. The generator and transformer are rated as follows.

Generator G1=20 MVA, 13.8Kv, reactance=20%

Generator G2=30 MVA, 18Kv, reactance=20%

Generator G3=30 MVA, 20Kv, reactance=20%

Transformer, T1=25 MVA, 220/13.8Kv, reactance=10%

Transformer, T2=3 single phase units each rated at 10MVA, 127/18Kv, reactance=10%

Transformer, T3=35 MVA, 220/22Kv, reactance=10%

Draw the reactance diagram using a base of 50MVA and 13.8 KV on the generator G1

4) Estimate the distance over which a load of 15000KW at a power factor 0.8 lagging can be delivered by a 3 phase transmission line having conductors each of resistance  $1\Omega$  per kilometre. The voltage at the receiving end is to be 132Kv and the loss in the transmission line is to be 5%.

## MOD 5

- 1) What is the fibrillation threshold of human being?  
a) 30 mA b) 75 mA c) 100 mA d) 4 A
- 2)..... is commonly used as earth electrode?  
a) Copper b) galvanised copper c) galvanised rubber d) galvanised iron
- 3) While earthing Soil treatment is employed for .....  
a) Increasing earth resistance b) reducing earth conductance c) reducing earth resistance d) none of these
- 4)Which among the following material is not used for soil treatment  
a) sodium chloride b)Magnesium sulphate c)calcium chloride d)zincsulphate
- 5)For transmitting power between 2 stations having different frequency ..... system is used?  
a) HVAC b)HVDC c)both d)none of these
- 6)40W florescent lamp will have a length of .....feet?  
a)8 b)12 c)16 d)4
- 7)ELCB is the short form of .....  
a)earth line contact bulb b)earth leakage circuit breaker c)earth leakage contact breaker d)engine line contact bulb
- 8)The term used for denoting the diameter of conducting wire is  
a)standard wire gauge b)gauge factor c)international gauge of standard d)none of these
- 9)Meggar is used to measure  
a)insulation resistance b) earth resistance c) both d) none of these
- 10)AC supply is used to meet our power demand because  
a)Produced power is in the form of ac b)For ac transformer is available for stepping up or down  
c)loss is less in ac d)dc cannot produce for large power level

11)Industrial unit of electrical energy is

- a)KW b)KW hr c)HP d)Ah

2 MARK

- 1)What is the function of choke in florescent lamp?
- 2)What happens if we connect a switch in neutral?
- 3)What is the difference between SPST and SPDT switches?
- 4)If a fan regulator is connected with a florescent tube what is the change we can observe?

4 MARK

- 1)What is the necessity of earthing in a power system?
- 2)Explain different types of earthing?
- 3) Draw and explain florescent lamp wiring.
- 4) Discuss the need of safety measures in electrical system
- 5) List out and explain the types of wiring
- 6)Name the different wiring accessories and explain the purpose of each.
- 7) Note down the basic principle of earthing

15 MARK

1)With simple layout explain generation, transmission and distribution of power in India

2) a)With diagram and switching conditions explain florescent lamp wiring?  
.....(7)

b )Compare dc and ac power transmission?.....(8)

3)a)With diagram explain staircase wiring and its switching conditions?.....(7)

b)With suitable switching conditions explain the diagram to wire up a corridor?.....(8)



**Course Code & Name : SDC4AE13 Electronic Engine Management Systems**  
**Unit I - ELECTRONIC FUEL INJECTION AND IGNITION SYSTEMS**  
**MCQ'S (One mark questions)**

1. Fuel is supplied due to its virtue of position; the fuel supply system is called  
(a) Gravity system (b) Pressure system (c) Height system (d) Pump system
2. ....determines the fuel quantity in engines where fuel supplied by injector.  
(a) Manifold pressure (b) Pulse width (c) Width of cylinder (d) Intake air quantity
3. Amount of fuel delivered by an injector is a function of the  
(a) Size of the injector (b) Pressure pushing fuel through the injector  
(c) Length of the time of the injector (d) All of these
4. K-Jetronic fuel system is an example for .....type of fuel injection system.
5. In Mechanical injection pump fuel at.....KPa in to metering distributor.  
(a) 7 (b) 700 (c) 7000 (d) 0.7
6. Separate injector is provided for each cylinder in .....type of Injection system  
(a) Continuous type (b) Intermittent type (c) Single point system (d) Multi point system
7. Base pulse width of an engine running at 2000rpm at load 3 will be  
(a) 2 (b) 4 (c) 6 (d) 8
8. Base pulse width of an engine running at 3000rpm at load 2 will be  
(a) 2 (b) 4 (c) 6 (d) 8
9. Base pulse width of an engine running at 4000rpm at load 2 will be  
(a) 2 (b) 4 (c) 6 (d) 8
10. Quality fuel distribution of fuel injection system is .....while compare with carburetor  
(a) Higher (b) Lower (c) Equal (d) None of these
11. Pulse width depend on the factor  
(a) Engine speed (b) Coolant temperature (c) Oxygen level (d) All of these
12. The most commonly used fuel supply system for car engine is  
(a) Gravity system (b) Pressure system (c) Height system (d) Pump system

**Two mark Questions**

1. Classify different fuel supply system.

2. Define the term fuel.
3. Explain the need of fuel injection system by stating any three defects of simple carburetion.
4. Note down any 2 important merit and demerits of Fuel Injection
5. List down the important factors which depends pulse width.
6. Write a formula to find out pulse width.
7. Classify fuel injection system according to duration and timing of fuel injection; explain any one among from that.
8. Classify fuel injection system according to number of fuel injector used; explain any one among from that.
9. Classify fuel injection system according to control method; explain any one among from that.
10. Classify fuel injection system according to duration & timing of fuel injection
11. Explain direct injection.
12. Draw the table to find out base pulse width of fuel injection.
13. Explain port injection.
14. Explain any two features of K-jetronic fuel injection.
15. What you mean by electronic injection.
16. Explain the need of hydraulic accumulator in K-jetronic fuel injection.
17. List down important sensor connected to ECU where fuel injection systems are using

#### **Four mark Questions**

1. Draw and explain Gravity, Pressure fuel supply system.
2. Define alternate fuel and list down the extensively used alternate fuels.
3. Explain the fuel injection system
4. Draw and explain simple carburetor with necessary essential parts.
5. Draw and explain the drawbacks of feedback carburetor system.

6. Comment on the necessity of FI in diesel engine and its advantage in gasoline engine while we replace it by carburetion.
7. Note down any the merits and demerits of Fuel Injection
8. Draw the table which used to find pulse width of fuel injection.
9. Compare fuel injection with carburetor method.
10. Draw simple carburetor with necessary essential parts, explain fuel injection.
11. Draw and explain throttle body injection.
12. Note down different correction factors indeed, solve the problem explained below
  - If the vehicle is moving with 3000rpm, load 4, coolant temperature of 40 degree Celsius, oxygen level 3. Find out the Pulse width
13. Note down different correction factors indeed, solve the problem explained below
  - If the vehicle is moving with 2000rpm, load 4, coolant temperature of 20 degree Celsius, oxygen level 2. Find out the Pulse width
14. Draw a single diagram to show the injector position in single, multi and direct injection system.
15. Draw and explain direct injection system.
16. Classify fuel injection system according to duration & timing of fuel injection; explain any one among from that.
17. Draw and explain port injection with neat sketches.
18. Draw a diagram to show the operation of mechanical port injection system.
19. Draw a diagram to show the operation of K-jetronic fuel injection.
20. List down important sensor connected to ECU where fuel injection systems are using; also explain one among from that.
21. Explain any two sensors connected to ECU where fuel injection systems are using.

### **Fifteen mark Questions**

1. Write an essay on fuel injection system
2. Explain Mechanical, K-Jetronic and Electronic Injection system with neat sketches

## Unit II - GASOLINE INJECTION SYSTEM

### MCQ'S (One mark questions)

1. Which automobile giant who credited for the development of single point fuel injection  
(a) Bosch (b) General Motors (c) Toyota (d) Ford
2. Injection pressure of DI is .....than air assisted system  
(a) Greater (b) lesser (c) same (d) Can't compare
3. No of injector needed to construct single point gasoline system is.....
4. Content of Normal Heptane for a fuel having octane number 75 is.....
5. The most commonly used fuel supply system for car engine is the  
(a) Gate valve (b) Globe valve (c) Butterfly valve (d) None of these
6. Approximately.....% of power increment is noted while we use supercharging  
(a) 20 (b) 40 (c) 60 (d) 80
7. To avoid knock in SI engine .....is added  
(a) Lead ethide (b) Ethyl alcohol (c) lead (d) None of these
8. Percentage of is-octane content in a fuel having octane number 100  
(a) 0 (b) 100 (c) 50 (d) can't say
9. Percentage of N-Heptane content in a fuel having octane number 75  
(a) 75 (b) 25 (c) 37.5 (d) can't say
10. ....type of valve is most commonly used in gasoline fuel system.  
(a) Ball valve (b) Globe valve (c) Butterfly valve (d) None of these
11. The drive for mechanical fuel pump is taken from the  
(a) Crankshaft (b) Camshaft (c) distributor shaft (d) any one of these
12. Cheapest yet reasonably precise gasoline injection system is the  
(a) Direct injection (b) Port injection (c) manifold injection (d) throttle body injection
13. Cheapest yet reasonably precise gasoline injection system is the  
(a) Direct injection (b) Port injection (c) manifold injection (d) throttle body injection

### Two mark Questions

1. Draw the block diagram of open loop fuel control system.
2. Draw the block diagram of close loop fuel control system.
3. List down the important fuel control systems.

4. State any four advantages of central fuel injection.
5. Draw the diagram of mono point fuel injection for a four cylinder engine.
6. Briefly explain the principle of hot wire anemometer.
7. Draw the diagram for tuned flexible injection system.
8. List down the various working modes of Bosch Motoronic gasoline injection system
9. What is stratified charge mode in Bosch Motoronic gasoline injection system?
10. What is homogenous mode of Bosch Motoronic gasoline injection system?
11. What is homogenous lean burn mode of Bosch Motoronic gasoline injection system.
12. Define supercharging.
13. Define Octane number
14. List down the available supercharger compressor available and name the most extensively used one.
15. Explain the term idle speed.
16. Explain the term lambda.
17. What do you mean by knock?
18. Is pinking useful for engine? Discuss.

#### **Four mark Questions**

1. Explain Open loop and closed loop fuel systems.
2. Explain Open loop and closed loop engine controls using its diagram.
3. What are the merits and demerits of Closed loop fuel control system.
4. Draw and explain the diagram of mono point fuel injection for a four cylinder engine.
5. Explain GDI and DI
6. Illustrate Multi-point fuel injection
7. Explain central fuel injection and also explain problem existing on this system.

8. Write a short note on Bosch Motoronic gasoline injection system.
9. Draw the diagram of DI and explain GDI.
10. Explain supercharging in gasoline engines.
11. Note down the important disadvantage of GDI also compares it with air assisted system.
12. Durability of spark plug is increases while we use air assisted system instead of GDI, discuss.
13. Classify and explain throttle bodies.
14. Explain any three working modes of Bosch Motoronic gasoline injection system.
15. Explain the following terms Idle speed, Lambda, Knock.
16. Briefly explain the phenomenon of knock in SI engines, Reasons for knock.
17. Explain stratified charge mode, Homogenous charge mode.
18. Explain stratified charge mode, Homogenous lean burn mode.

#### **Fifteen mark Questions**

1. Explain the components of gasoline injection system.
2. Explain Bosch Motoronic gasoline injection system with its different working modes.

### **Unit III - DIESEL INJECTION SYSTEM**

#### **MCQ'S (One mark questions)**

1. Primary diesel engine filter is mounted in between.....  
(a) Fuel pump and Injection Pump (b) Injection pump and Injector (c) Fuel tank and fuel pump  
(d) none of these

2. Secondary diesel engine filter is mounted in between.....
  - (a) Fuel pump and Injection Pump
  - (b) Injection pump and Injector
  - (c) Fuel tank and fuel pump
  - (d) none of these
  
- 3.....controls the exact fuel metering fuel into cylinder of diesel engine
  - (a) Fuel pump
  - (b) Fuel Injector
  - (c) Primary fuel filter
  - (d) Secondary fuel filter
  
4. ....atomizes fuel into fine droplet
  - (a) Fuel feed pump
  - (b) Fuel Injector
  - (c) Fuel injection Pump
  - (d) None of these
  
5. ....type of diesel injection system is widely used for static high power engine, Marine engines.
  
6. Fuel is supplied by means of air compressor in the Air injection system pressure in the range of.....Mpa
  - (a) 1
  - (b) 7
  - (c) 20
  - (d) 35
  
7. In .....Type diesel injection system low grade fuel like LSHS can be employed.
  
8. Conical diffuser is an important part of .....type of filter.
  
9. 95% abrasive particle is separated out at .....filter
  
10. Wire mesh and oil bath is integral part of which type air cleaner
  - (a) Light duty
  - (b) Medium duty
  - (c) Heavy duty
  - (d) Centrifugal pre cleaner
  
11. The injection pressures generally employed in case of automotive engine fuel injection range from
  - (a) 70 to 300 MPa
  - (b) 2 to 7 MPa
  - (c) 7 to 30 MPa
  - (d) None of these
  
12. Which automobile manufacturer developed diesel super charger(G-Charger)
  - (a) GM
  - (b) Toyota
  - (c) Volkswagon
  - (d) Ford
  
13. The compression ratio in diesel engine is usually.
  - (a) 7:1
  - (b) 15:1
  - (c) 10:1
  - (d) 22:1
  
14. Cylinder temperature after compression in diesel engine is approximately.....degree Celsius.
  - (a) 300
  - (b) 400
  - (c) 600
  - (d) 800
  
15. A glow plug is a
  - (a) Staring
  - (b) Acceleration
  - (c) deceleration
  - (d) Idling

### **Two mark Questions**

1. Define the term diesel.
2. List the various properties to characterize diesel fuel.
3. What do you mean by Viscosity, Volatility?

4. What do you mean by Cold behavior, Volatility?
5. Classify injection system, which one is widely used for static engines.
6. Note down the advantage & disadvantage of Air injection system.
7. Classify solid Injection system.
8. Classify mechanical Injection system.
9. Classify Air Cleaners.
10. List out the various governors used in diesel engine.
11. Compare various injection systems.
12. List down various cold starting devices.
13. Draw glow plug used in diesel engine.

#### **Four mark Questions**

1. Explain the phenomenon of combustion, need of Injection in diesel engine,
2. Explain Air injection system with its advantages & disadvantages.
3. Classify solid injection system & explain any one among from them.
4. Write a short note on diesel engine fuel systems with its function.
5. Draw and explain individual pump & nozzle system.
6. Draw and explain unit injector system.
7. Draw and explain common rail system.
8. Draw and explain distributor fuel system.
9. Classify Air Cleaners, draw and label any one of them.
10. Draw and explain sedimentation type primary filter.
11. Illustrate Light duty Oil bath air cleaner with necessary diagrams.
12. Draw suction and delivery modes of Distributor fuel injection pump.
13. Explain Distributor fuel injection Pump with necessary diagram.
14. Explain supercharging in diesel engine.
15. Compare various diesel injection systems.
16. Draw & Explain glow plug used in diesel engine.
17. Explain engine management in CRS
18. Write a short note on cold starting devices.
19. A diesel engine does not start or stalls just after starting, comment on possible causes.
20. A diesel engine feels lack of power, comment on possible causes.

#### **Fifteen mark Questions**

1. Write an essay on modern common rail fuel injection system
2. Classify explain diesel injection system.
3. Explain diesel engine fuel supply system by illustrating the functions of various systems associated with it.

## **Unit IV - IGNITION SYSTEMS**

### **MCQ'S (One mark questions)**

1. the three components of primary ignition circuit are
  - (a) Contact breaker, condenser, and distributor
  - (b) Contact breaker, Ignition coil, and spark plug
  - (c) Contact breaker, Ignition switch, and distributor
  - (d) Contact breaker, Ignition switch, and rotor
2. Contact breakers are generally made of
  - (a) Plastic (b) Steel (c) Copper (d) Tungsten
3. .... is the most commonly used exhaust gas oxygen sensor.
  - (a) Plastic (b) Steel (c) Copper (d) Tungsten
4. The contact breaker gap measured using
  - (a) Steel rule (b) Dial gauge (c) Dwell meter (d) feeler gauge
5. Capacity of an engine condenser would be.....microfarad
  - (a) 2 (b) 0.2 (c) 20 (d) 200
6. The commonly used material for spark plug is
  - (a) Bakelite (b) asbestos (c) Alumina (d) Copper
7. A spark may be fouled by
  - (a) Oil (b) Petrol (c) Lead (d) All of these
8. Which one is most commonly used as mass air flow sensor?
  - (a) Plastic (b) Steel (c) Copper (d) Tungsten
9. HEI was developed by
  - (a) GM (b) Toyota (c) Volkswagen (d) Ford
10. Dwell period is depend on
  - (a) Spark plug gap (b) Compression ratio (c) size of the engine (d) engine speed
11. For transmitting same power thickness of cable in 6V battery system is compared to 12V System
  - (a) Double (b) Half (c) Same (d) One fourth
12. Magneto ignition system is preferred in.....wheeler vehicles.
13. Terminal nut is part of
  - (a) Contact breaker (b) spark plug (c) Distributor (d) Ignition coil
14. To ignite fuel approximately .....V is required for ignition

(a) 12 (b) 25000 (c) 2500 (d) 250000

### **Two mark Questions**

1. Note down the requirement of ignition system.
2. List down the essential components of battery ignition system.
3. Why the 2- wheeler, Mopeds are preferred to use magneto ignition system.
4. Why most of the automobile engines are preferred to use battery ignition system over magneto ignition system?
5. Explain contact breaker.
6. Explain Ignition distributor.
7. Explain Spark Plug.
8. Define equivalence ratio.
9. What is the interrelation of ignition and combustion?
10. Classify ignition system, state which one will be suit for heavy static engines.
11. What you mean dwell angle.
12. What are the different types of electronic ignition system?
13. Briefly explain the phenomenon of spark production in CDI.
14. What are the two conventional ignition systems that used in automobiles?
15. Mention the qualities of good ignition system.
16. What is the main function of spark plug?
17. Note any two advantages of 12V battery usage over 6V system.

### **Four mark Questions**

1. Draw and the schematic diagram of Conventional coil ignition system for four cylinder engines.
2. Draw and the schematic diagram of High tension magneto ignition system
3. Write a note on Exhaust gas oxygen sensor.
4. Draw and explain Ignition Coil.
5. Draw and explain contact breaker.
6. Draw and explain Ignition distributor.
7. Draw and explain Spark Plug.
8. Explain the working of battery ignition system.
9. Explain the working magneto ignition system.
10. What are the advantages of 12V battery usage over 6V system.
11. Draw the diagram of Capacitance discharge ignition system.
12. Explain Transistorized coil ignition system.
13. Write a short note on Engine speed sensor.
14. Explain firing order.
15. Explain HEI.
16. State the concept of contactless ignition system.
17. Classify electronic ignition system, explain any one among from it.
18. what is capacitance spark, how it is produced.
19. Explain the details of firing order.

### **Fifteen mark Questions**

1. Write an essay on solid state ignition.
2. Explain Capacitance discharge, Transistorized coil ignition system with necessary diagrams.

3. Write an essay on TCI and CDI.

4. Write an essay on Electronic ignition system.

**Course Code &Name :SDC4AE14 MICROPROCESSORS AND APPLICATIONS**

**UNIT I**

**PART A**

1. Operation code field is present in :
  - (a) programming language instruction
  - (b) assembly language instruction
  - (c) machine language instruction
  - (d) none of the mentioned
  
2. A machine language instruction format consists of
  - (a) Operand field
  - (b) Operation code field
  - (c) Operation code field & operand field
  - (d) none of the mentioned
  
3. The length of the one-byte instruction is
  - (a) 2 bytes
  - (b) 1 byte
  - (c) 3 bytes
  - (d) 4 bytes
  
4. ASCII stands for .....
  - (a) American Standard Code for Information Interchange
  - (b) American Super Computer for Information Interchange
  - (c) American Semi Conductor for Information Interchange
  - (d) None of the above
  
5. The program which converts Assembly language into machine language is
  - (a) Compiler
  - (b) Assembler
  - (c) Interpreter
  - (d) None of the above
  
6. The register which stores the address of next instruction is
  - (a) Instruction registers
  - (b) Program counter
  - (c) Index registers
  - (d) general purpose register
  
7. Data transfer bus is .....
  - (a) bi-directional
  - (b) uni-directional
  - (c) simplex
  - (d) none of the above
  
8. Machine language is
  - (a) Machine dependent
  - (b) Machine independent
  - (c) Machine dependent or Machine independent
  - (d) None of the above
  
9. LSI stands for .....
  - (a) Large Scale Integration
  - (b) Long Scale integration
  - (c) Little Scale Integration
  - (d) Low Scale Integration

10. A group of four bits is known as
- byte
  - half byte
  - nibble
  - none

### **PART B**

- What are the basic units of microprocessor?
- What is a microprocessor?
- What is an assembler?
- What is an ASCII code?
- What is the difference between microcomputer and microprocessor?
- Name any three register in 8085 microprocessor.
- What do you mean by program counter?
- What do you mean by stack pointer?
- What is bus? What is the difference between uni-directional and bi-directional bus?
- Why data bus is bi-directional?
- Define machine cycle.
- Define T-state.
- What is fetch and execute cycle?
- List the flags of 8085
- What is opcode fetch cycle?

### **PART C**

- Define bit, byte, nibble, and word.
- Briefly explain about SSI, MSI, LSI?
- What you mean by the three cycle execution model?
- Differentiate hand assembly and assembler.
- Briefly explain about system bus.
- Briefly explain about flag register.

### **PART D**

- Explain about the register organization in 8085 microprocessor.
- Explain the architecture of 8085 micro processor with a neat diagram.

## **UNIT II**

### **PART A**

- The number of instructions in 8085 is
  - 74
  - 86
  - 255
  - none of the above
- Name the 16-bit register in 8085 microprocessor
  - stack pointer
  - program counter
  - (a) & (b)
  - none of the above
- The instruction "JUMP" belongs to
  - sequential control flow instructions
  - control transfer instructions
  - branch instructions
  - control transfer & branch instructions

4. The instructions which after execution transfer control to the next instruction in the sequence are called
  - (a) Sequential control flow instructions
  - (b) control transfer instructions
  - (c) Sequential control flow & control transfer instructions
  - (d) none of the mentioned
5. Which of the following is not a bus
  - (a) Address bus
  - (b) Data bus
  - (c) Control bus
  - (d) Pointer bus
6. Decoder decodes the instruction which is present in
  - (a) IR
  - (b) PC
  - (c) ACC
  - (d) None of the above
7. The memory location is identified by the contents of
  - (a) HL register pair
  - (b) AB register pair
  - (c) Memory register
  - (d) Address register
8. The instruction used to find One's complement is
  - (a) COMP
  - (b) CMA
  - (c) ADD
  - (d) NONE
9. JNZ is for
  - (a) going to the specified address if the zero flag is set
  - (b) going to the specified address if the zero flag is not set
  - (c) going to the next instruction if the zero flag is set
  - (d) going to the next instruction if the zero flag is not set
10. HLT instruction is to
  - (a) Start executing the program
  - (b) Pause executing the program
  - (c) Stop executing the program
  - (d) None of the above

## **PART B**

1. What do mean by an instruction?
2. Name any three instructions of 8085 microprocessor.
3. What do you mean by implied operand?
4. What do you mean by immediate data?
5. What does the following instruction do?

## **LXI B 4000H**

6. What are the different kinds of operations?
7. What is a program?
8. How does the memory location is identified?
9. What do you mean by Accumulator?
10. What is the difference between direct addressing and immediate addressing?

### **PART C**

1. What are the different types of operands?
2. What is the size of an instruction in 8085 microprocessor?
3. What are the different addressing modes?
4. Write an 8085 code to find one's complement.
5. Draw a flowchart to find the square of a given number in 8085 microprocessor.

### **PART D**

1. Explain about 8085 instructions in detail.
2. Write an 8085 code to perform following operations
  - a) Exchange the contents of memory locations 2000H and 4000H
  - b) Add two 8-bit numbers.

## **UNIT III**

### **PART A**

1. In PUSH instruction, after each execution of the instruction, the stack pointer is
  - (a) incremented
  - (b) decremented
  - (c) not changed
  - (d) set to zero
2. The Stack follows the sequence
  - (a) first-in-first-out
  - (b) first-in-second-out
  - (c) last-in-first-out
  - (d) last-in-last-out
3. The stack is useful for
  - (a) storing the register status of the processor
  - (b) temporary storage of data
  - (c) storing contents of registers temporarily inside the CPU
  - (d) all of the mentioned
4. The Stack is accessed using
  - (a) SP register
  - (b) SS register
  - (c) SP and SS register
  - (d) none
5. While CPU is executing a program, an interrupt exists then it
  - (a) follows the next instruction in the program
  - (b) jumps to instruction in other registers
  - (c) breaks the normal sequence of execution of instructions
  - (d) stops executing the program
6. An interrupt breaks the execution of instructions and diverts its execution to
  - (a) Interrupt service routine
  - (b) Counter word register
  - (c) Execution unit
  - (d) Control unit

7. Whenever a number of devices interrupt a CPU at a time, and if the processor is able to handle them properly, it is said to have
  - (a) interrupt handling ability
  - (b) interrupt processing ability
  - (c) multiple interrupt processing ability
  - (d) multiple interrupt executing ability
  
8. NMI stands for
  - (a) non-maskable interrupt
  - (b) non-multiple interrupt
  - (c) non-movable interrupt
  - (d) none
  
9. The INTR interrupt may be
  - (a) maskable
  - (b) non-maskable
  - (c) maskable and non-maskable
  - (d) none
  
10. The Programmable interrupt controller is required to
  - (a) handle one interrupt request
  - (b) handle one or more interrupt requests at a time
  - (c) handle one or more interrupt requests with a delay
  - (d) handle no interrupt request

#### **PART B**

1. What do you mean by stack?
2. Why stack is known as LIFO architecture?
3. How do we define stack in 8085 microprocessor?
4. What are the different operations that can be performed over stack?
5. What is the difference between PUSH and POP operations?
6. What do you mean by PSW register pair?
7. What do you mean by subroutine?
8. How do we calculate delay if we have number of T-states and frequency?
9. What do you mean by interrupt?
10. Name the different interrupts of 8085 microprocessor.
11. What is meant by ISR?
12. What do you mean by TRAP?
13. Give the priority list of interrupts in 8085 microprocessor.

#### **PART C**

1. Briefly explain PUSH operation.
2. Briefly explain POP operation.
3. What do you mean by subroutine? How they are handled in 8085 microprocessor?
4. Explain the operation of a loop counter with the help of a flowchart.
5. What is an interrupt? What are the types of interrupt? How do we handle interrupts?
6. Name the different interrupts of 8085 microprocessor.
7. What is the difference between ISR and TRAP?

## PART D

1. Explain in detail about stack and subroutines.
2. Explain in detail about the following
  - a) Maskable and Non-Maskable interrupt
  - b) Vectored and Non-Vectored interrupt
  - c) Different interrupt inputs in 8085

## UNIT IV

### PART A

1. The instructions that are used for reading an input port and writing an output port respectively are
  - (a) MOV, XCHG
  - (b) MOV, IN
  - (c) IN, MOV
  - (d) IN, OUT
2. RAM stands for .....

  - (a) Random Access Memory
  - (b) Random Available Memory
  - (c) Recent Available Memory
  - (d) Recent Access Memory

3. ROM stands for .....

  - (a) Read Output Memory
  - (b) Read Optimum Memory
  - (c) Read only memory
  - (d) None

4. Which of the following is a keyboard/display controller?
  - (a) 8085
  - (b) 8086
  - (c) 8279
  - (d) None
5. The 8257 is able to accomplish the operation of
  - (a) verifying DMA operation
  - (b) write operation
  - (c) read operation
  - (d) all of the mentioned
6. If more than one channel requests service simultaneously, the transfer will occur as
  - (a) multi transfer
  - (b) simultaneous transfer
  - (c) burst transfer
  - (d) none of the mentioned
7. The number of clock cycles required for a 8257 to complete a transfer is
  - (a) 2
  - (b) 4
  - (c) 8
  - (d) none of the above

8. The transfer mode in which data transfer takes place only in one direction is known as
  - (a) simplex
  - (b) half-duplex
  - (c) full-duplex
  - (d) none
9. Which of the following is not an error checking method
  - (a) odd parity
  - (b) even parity
  - (c) checksum
  - (d) flag

#### **PART B**

1. What is the function of memory interfacing?
2. How many bytes make a word of 32 bits?
3. What are the instructions for data transfer between processor and I/O devices?
4. What is memory map?
5. What is synchronous data transmission?
6. What are the rules to be followed during asynchronous data transmission?
7. What is the difference between serial and parallel transmission?
8. What do you mean by even parity?
9. What are the error checking methods?
10. What is checksum?

#### **PART C**

1. What is the function of I/O interfacing? Which are the instructions used for it?
2. Briefly explain about the memory subsystem present in the microprocessor.
3. Differentiate simplex and duplex transmissions.
4. Briefly explain about the error checking methods?

#### **PART D**

1. Explain about data transmission and error checking in detail.
2. Explain about 8255 and its working in detail.

### **UNIT V**

#### **PART A**

1. The instruction that is used to transfer the data from source operand to destination operand is
  - (a) data copy/transfer instruction
  - (b) branch instruction
  - (c) arithmetic/logical instruction
  - (d) string instruction
2. Which of the following is not a data copy/transfer instruction?
  - (a) MOV
  - (b) PUSH
  - (c) DAS
  - (d) POP
3. The instructions that involve various string manipulation operations are
  - (a) branch instructions
  - (b) flag manipulation instructions
  - (c) shift and rotate instructions
  - (d) string instructions

4. Which of the following instruction is not valid?
  - (a) MOV AX, BX
  - (b) MOV DS, 5000H
  - (c) MOV AX, 5000H
  - (d) PUSH AX
  
5. The instruction that supports addition when carry exists is
  - (a) ADD
  - (b) ADC
  - (c) ADD & ADC
  - (d) none of the mentioned
  
6. The instruction, MOV AX, [2500H] is an example of
  - (a) immediate addressing mode
  - (b) direct addressing mode
  - (c) indirect addressing mode
  - (d) register addressing mode
  
7. If the data is present in a register and it is referred using the particular register, then it is
  - (a) direct addressing mode
  - (b) register addressing mode
  - (c) indexed addressing mode
  - (d) immediate addressing mode
  
8. The addressing mode that is used in unconditional branch instructions is
  - (a) intrasegment direct addressing mode
  - (b) intrasegment indirect addressing mode
  - (c) intrasegment direct and indirect addressing mode
  - (d) intersegment direct addressing mode
  
9. The instruction, MOV AX, 1234H is an example of
  - (a) register addressing mode
  - (b) direct addressing mode
  - (c) immediate addressing mode
  - (d) based indexed addressing mode

## **PART B**

1. What are low- and high-level languages?
2. What do you mean by Mnemonic?
3. Which are the two blocks of 8086 microprocessor?
4. What is Execution Unit?
5. What is Bus Interface Unit?
6. Name the different areas in memory with respect to 8086.
7. What do you mean by segment register?
8. Name the addressing modes in 8086 microprocessor.
9. Name any 3 data transfer instructions of 8086.
10. Name any 3 arithmetic instructions of 8086.

**PART C**

1. Briefly explain about the addressing modes in 8086 microprocessor.
2. Briefly explain about Execution Unit.
3. Briefly explain about Bus Interface Unit.
4. Briefly explain about any four instructions of 8086.

**PART D**

1. Explain in detail about registers and flags used in 8086.
2. Explain the architecture of 8086 in detail.

\*\*\*\*\*END\*\*\*\*\*