BME 332

BIOMEDICAL ELECTRONICS

AOC

- The main electronic elements in a BES
- In a tabular form difference between Fermi Level & Fermi Energy
- Five area of application of bioelectronics
- Short note on origin of bioelectronics
- Diagrams of Band theory of solids
- Define valence electron
- Characteristics of insulators
- Analog circuits are computed of what
- Relationship between thermionic emission & thermionic current
- Application of thermionic emission

AOC

1. A transistor is 3-terminal semiconductor device that can be used for amplication and switching TRUE / FALSE

2. Bipolar function Transistors can be created by forming a sandwich out of 3 regions of doped silicon TRUE / FALSE

3. In most case, the drain and source form the data terminals and the gate act as the control terminal TRUE / FALSE

4. In application of semiconductors, the transistor can act as a switch TRUE / FALSE

5. Light Emmiting Diodes are examples of application of semi conductor TRUE / FALSE

Section C 6. Write short note on the brief history of the vacuum tube.

7. Operational Amplifier is an analog circuit TRUE FALSE

8 The commonest type of feedback is the negative feedback TRUE / FALSE

9 Early Op amp circuits used Vacuum tubes

10 The Ideal Operational Amplifier (IOA) ~~model~~ is a differential voltage amplifier with a single ended output TRUE / FALSE

11 For an ideal Op Amp both input signal are equal that means that $(V_B - V_A) = 0$

12 Ideal op amp model makes use of the following assumptions

_____, _____, _____

_____, _____

13 Functional Categories of op Amp included

Low noise _____, _____, _____,

& _____

20

14 5 Op Amps Applications are
Inverting Amplifiers , _____ , _____ , _____ 8

15 Three bands of filters include
_____ , _____ , _____ , _____
& _____

16 Disadvantages of use of inductors in filters
Seven problems are introduced by the use of the _____ as a circuit component in a filter
These problems include
_____ , _____ , _____ , _____ 4
2

17 Active filters are preferred to passive filters because
_____ [Just one word be asked] ;
Commonly used active filters are
_____ , _____ , _____ and
_____

18. Medical Electronics is responsible for the design of devices and measures that solve medical & health related problems by combining their knowledge of biology & medicine with engineering principles & practices

19. Medical Electronics develops troubleshooting skills for analog circuits, digital circuits and processors as well as understanding the operation of medical electronic equipment
Examples are
ECG instruments, Defibrillators, Incubators, Digital Xray, MRI

20 How does electronics differ from other electronic engineering.

Ans It studies electronics more related to instrumentation and applications of electronics in medical domain eg MRI, Xray, ECG, EEG prosthetics.

21. Electronics specifically applied to medical applications may be divided into ____ categories
(a) 2 (b) 3 (c) (d) 4 (e) 5

22. Electronic specifically applied to medical applications include
CORRECT ANSWER – Medical Electronics for Data acquisition
– Medical Electronics for Therapy

23 The source which supplies a voltage to be across when it occur
(a) Voltage source (b) Current source (c) Power source

24. The equivalent resistance of resistors in series is given as.
ANSWER $R_E = R_1 + R_2$ or $R_E = \sum_{K=1}^{N} R_K$

25. Assignment 3.
No 3 & 4
Draw circuit diagrams when solving

Kirchoff Voltage Law solving

SECTION C
a. define
b. List
c. Tabular form
d. Mathematics

26. Analog circuits are composed of components include resistor, inductors, capacitors, transistor diodes ~~Op Amps~~

27 Op Amps are used in many signal conditioning Applications such as differential Amplifiers, _____, _____, _____, _____

28 Thermionic emission is the basis of many electronic devices such as vacuum tubes, Cathode ray tube, X-ray tube, Actinic microtype thermionic Converters

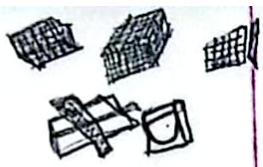
29 The relationship between thermionic current & temperature can be described by the Richardson Dushmen Equation given by

$$J = AT^2 e^{-e\phi_w / K_B T}$$

J is _____ K is _____

A is _____ ϕ is _____

T is _____



Section C — Applications of thermionic emission

- Invention of vacuum tube J.A Fleming in 1904
- Two shared phenomena between electrons and electricity ⇒ the electricity + negative
- Between 1800 and 1875 basic physical phenomena were discovered culminating to be practical application of the telephone, phonograph, microphone, A & B, <u>All of the above</u>
- Electronics began to evolve seperately from electricity late in the 19th century with the identification of electron by JJ Thomson and measurment of electron charge by Robert A Millikan in 1909

TRUE / FALSE

- ~~Transistor~~ Vacuum tube is 1st Generation
- Transistor is 1st generation
- IC is 2nd generation
- SSI is Small scale Integration
- MSI is Middle scale Integration

LSI - Large Scale Integration

VLSI - Very Large Scale Integration

VLSI - Fifth gen

ULSI - 5th gen

- Amplification of weak signals

a) Non linear behaviour of electronic component

b) Linear behaviour of electronic components

c) ability to control electron flow

(d) A & C

e) A & B

- Electron originated from identifying electron emanating as ray from the cathode & to vacuum tube invented by

Ans J.A Fleming in 1897

- Hydrogen has ___ no of isotopes

Ans 3

- Amount of matter in a given Object

Ans Mass

- Electron Theory states that all matter is composed of

Ans Molecules

- Electronic configuration differ in

Ans Molecules & State of Matter

with the aid of a diagram only distinguish between the

Section C - Band Theory of Solids (Diagram)

Section C - Define Valence Electron

Section C - In a tabular form distinguish between Fermi Energy & Fermi Level

Section C - List 5 characteristics of Insulator Energy Band

TRUE / FALSE

- The forbidden energy gap is very small in semiconductor energy band TRUE
- The forbidden gap for Germanium is 0.7 ev TRUE
- Forbidden gap for Si is 1.1 ev TRUE
- The semi conductor is neither an insulator nor a good conductor TRUE

- As the temperature increases, the conductivity of a semi conductor increases TRUE
- Conductivity of a semi conductor is in order of 10^2 mho-meter TRUE

Conductor Energy Band in

- There exists no forbidden gap in a conductor TRUE
- The valence band and the conduction band gets overlapped TRUE
- The free electron available for conduction are plenty TRUE
- A slight increase in voltage increases the conduction TRUE
- NO concept of hole formation as a continuous flow of electron contribute the current TRUE

section C - write short note on Electron flow in conductors & Insulators

section C - Define Doping of Semi conductors

- Bioelectronics applies the principle of Electronics (Broadly) to Biology.

Section C

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- Application of Bioelectronics
- write short note on origin of bioelectronics
- The main electronic element in a BES electronic integrated system
  - ✓ electrodes
  - ✓ field effect transistor devices
  - ✓ Piezoelectric crystal
  - ✓ Magnetoresistance recording media
  - ✓ Scanning tunneling microscopy (STM) type