Tanta University	Biomedical Engineering Program	Faculty of Engineering
Course Title: Healthcare Technology Project II Date: **18 June, 2025**	Course Code: EEC292 Time Allowed: **2 hours** **Final Exam** (Total points: **40**)	Students: **Level 2** No. of Pages: **2**

Remarks: **Answer All the following questions**

Question 1: Compare between each of the following: [10 Points]

a) The five types of the intellectual property. Then, state the steps of copyright protection.

b) The design for manufacturing, and the product design in terms of the focus, primary goal, manufacturing considerations, cost consideration, and end goal.

c) Modular and integrated product architectures.

Question 2: Answer the following: [10 Points]

a) A company is looking to design wearable heart monitoring devices, what is the recommended prototyping technique? Then, mention the used prototyping process steps to be followed.

b) For design for environmental (DFE):
   1. define the concept of DFE,
   2. discuss its importance in healthcare, and
   3. provide an example of using DFE in medical product.

c) What are the factors affecting the architecture modularity?

Question 3: Answer the following: [10 Points]

a) Complete:
   1. ..... refers to how well a device performs its intended purpose, while ..... refers to how comfortable and easy it is for users to interact with the device.
   2. The main types of medical product specifications are ....., ..., ..., ..., ...
   3. ..... is a framework (a set of tools) that allows to build apps for mobile, web, and desktop using one codebase.
   4. The key phases of healthcare technology project management include initiation and planning, design and development, ..., evaluation and monitoring, ...

5. ..... is a method to quantify the environmental impact over the product's entire life cycle.

b) Explain the importance of the industrial design in medical device manufacturing.

c) Give an example of a medical product that benefits from CNC milling in the prototyping phase, with explaining the reason behind using CNC milling, specifically.

Question 4: Answer the following: [10 Points]

a) What is the best prototyping method for disposable medical components?

b) Explain the role of the modular design in DFM.

c) Write a function that prints a greeting statement using Dart. Then, clarify the function of using setState() in Flutter. Finally, write the code for adding a new task to a list using Flutter?

End of Questions *Good luck*

Prof. Amira Salah Ashour

Tanta University

Department: Electronics & Electrical Communications
(Biomedical Program)
Total Marks: (40) Marks

Faculty of Engineering

Course Title : Bioelectronics and Sensors
Date 21 /6/2025

Course Code: EEC 271
Allowed time: (2) hrs.

level 1: 2024/2025
No. of Pages: (1)

Answer the following Questions

Q1

Using sketches, define a sensor as a general device, and then explain when it is called a biosensor.

(7 Marks)

Q2

State the applications of the following sensors as medical devices:

i- *Pressure sensors.*

ii- *Magnetic sensors*

iii- *Explain the importance of the signal conditioner, and then draw its circuit?,*

(9 Marks)

Q3

Draw a general block diagram of a medical instrumentation system and explain the function of each part?

(8Marks)

Q4

The block diagram shown in ***Fig 1*** *is a Part of a medical measuring system.*

i- *What is the name of this block diagram.?*

ii- *The function of Sample and Hold circuit.?*

iii- *Draw a circuit for one type of A/D converter, hence state its function.*

16Marks)

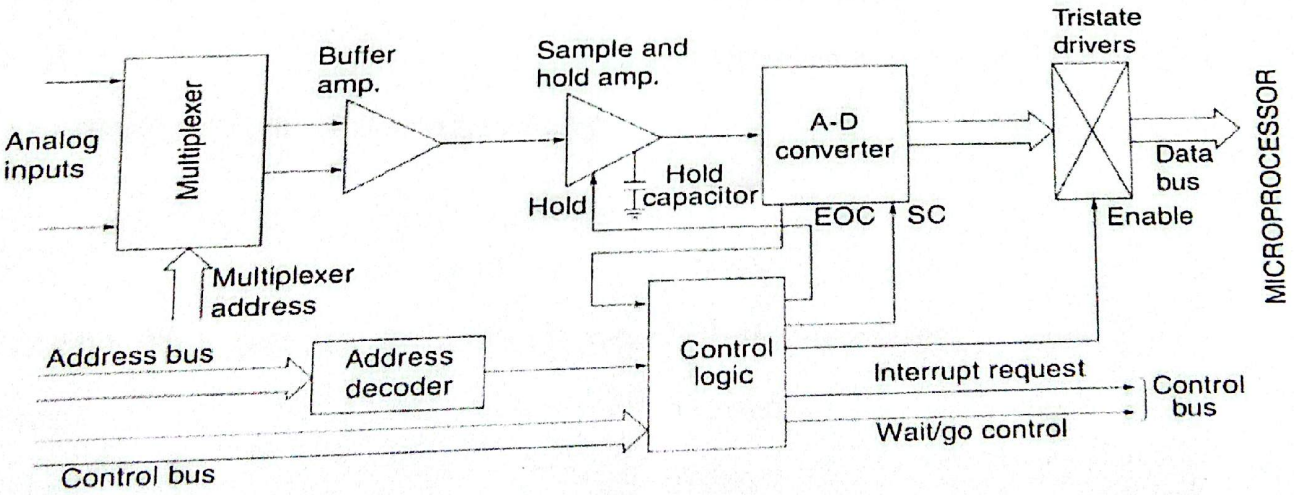


Fig 1

Good Luck

Biomedical Engineering Programme

Total Marks: 40 Marks

Course Title: Electronic Measurments	Course Code: EEC 214	Level 2
Date: 31/05/2025	Allowed Time: 2 Hours	No. of Pages: 3

Answer all the following questions

Q1: Choose the correct answer

1. An attenuator is used in the input stage to.....

a) Select voltage range

b) Attenuates the input voltage

c) Amplify the input voltage

d) Remain the input voltage constant

2. In balanced bridge TVM has.....

a) Two identical transistors

b) Two identical operational amplifiers

c) Two different transistors

d) Two different operational amplifiers

3. The main difference between AC voltmeter circuit and DC voltmeter circuit is:

a) Using a rectifier

b) Using amplifier

c) Using attenuator

d) Using transistor

4. The maximum value attained by the AC waveform either in the positive half cycle or negative half cycle

a) Peak value

b) Average Value

c) RMS value

d) Mean value

5. A Thermocouple is a sensor used to measure:

a) Voltage

b) Temperature

c) Current

d) Resistance

6. The resolution of ADC is characterized by:

a) n^2

b) 2^n

c) 2n

d) n/2

7. The ramp voltage goes ..... until it exceeds the input voltage.

a) negative

b) positive

c) constant

d) down

8. Dual slope conversion is a/an..... method for A/D conversion.

a) indirect
b) direct
c) slow
d) high

9. Flash A/D converters, also known as ..... comparator ADC

a) simultaneous
b) parallel
c) all the previous
d) none of them

10. The accuracy of dual slope ADC is ..... Flash type.

a) more than
b) less than
c) Faster than
d) slower than

11. The servomotor in Servo Potentiometric type DVM moves the sliding contact proportional to:

a) the error signal
b) the input signal
c) the output signal
d) All the previous

12. Which of the following is considered as a type of seven segment display?

a) Common anode
b) Common cathode
c) a and b
d) Decoder

13. The smallest change in the input which a digital meter should be able to detect.

a) Resolution
b) sensitivity
c) Accuracy
d) True value

14. Voltage to Frequency Converter Type DVM, if the input voltage increases, the frequency.....

a) Increase
b) Decrease
c) Remains constant
d) Reduces to half

15. The main advantage of the period mode in DFM is that the accuracy is greater for the .....input signals.

a) low frequency
b) high frequency
c) low amplitude
d) high amplitude

16. The crossover frequency obtained at .....

a) $N_p > N_F$
b) $N_p < N_F$
c) $N_p = N_F$
d) $N_p \geq N_F$

17. Converts a physical quantity at the input to an electrical signal at the output, mainly for measurement purposes:

a) Transducer
b) Actuator
c) Sensor
d) Transmission

18. A Transducer which is directly connected to the measurable quantity is known as a

a) primary transducer
b) secondary transducer
c) primary sensor
d) secondary sensor

19. Converts measurand input into electrical signal

a) Active transducer
b) Passive transducer
c) Primary transducer
d) Secondary transducer

20. Converts the input quantity to electrical output which is in a digital form

a) Digital Transducer
b) Analog transducer
c) Active transducer
d) Passive transducer

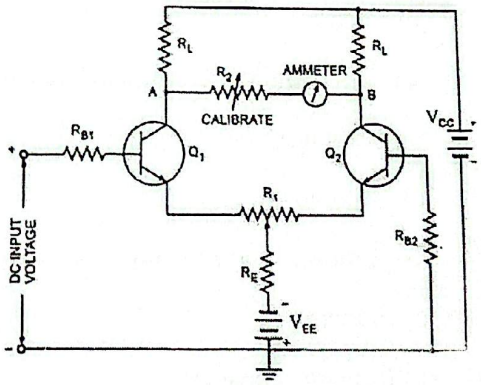
Q2: Answer four points only of the following questions:

1. In the circuit shown
   i. What is the purpose of R_1 and R_2?
   ii. The main advantages of it.

2. Write down the classification of the measuring instruments.

3. Compare AC Voltmeter with First Amplification and AC Voltmeter with First Rectification

4. Mention the advantages and disadvantages of Successive Approximation Type DVM.



Circuit Diagram of Balanced Bridge TVM

5. **For 4-bit successive approximation ADC circuit,**
   a) Find the digital output for 2.34 V analogue input if the reference voltage is 5 V showing the solution steps.
   b) Determine the resolution of that ADC.
   c) Find the conversion time if clock frequency equals.

Tanta University	Biomedical Engineering Program.	Faculty of Engineering

Course	Electromagnetic waves Code : EEC 132	Level (1)	2024/2025	Total Marks	40
Date	25/6/2025		No. of Pages (2)	Time	2 hrs

Hint : $\mu_o = 4\pi \times 10^{-7}\ H/m$, $\varepsilon_o = 8.854 \times 10^{-12}$ F/m

Question Number (1) **(10 Points)**

1-The electric field in **free space** is given by

$$E = 50\ cos\ (10^8 t - \beta z)\ a_x\ V/m$$

(a) Find the direction of wave propagation.

(b) Calculate α, β, γ , ω, the **skin depth** and the **phase velocity**.

(c) The magnetic field component.

(d) The **pointing vector** and the **average pointing** vector <P>

2- Suppose medium 1 and medium 2 both are dielectric media with $\epsilon_1 = 4\epsilon_o$ and $\epsilon_2 = 4\epsilon_o$ and $\mu_1 = \mu_o$ and $\mu_2 = 2\ \mu_o$ Let their interface lie on **the *x-y* plane** and the **electric** field and the **magnetic field** at the interface in medium1are given by:

$$E_1 = 8x\hat{} - 10y\hat{} + 5\ z\hat{}$$

$$H_1 = 3x\hat{} + 2y\hat{} + 15z\hat{}$$

Derive E_2 and H_2 at the interface in medium2

Question Number (2) **(10 Points)**

1. Suppose we **have lossless Transmission line** with the equivalent circuit parameters **L=0.5(μH/m)**, and **C = 25(pF/m)** operate at frequency $f =$ **300 *MHz*** Please find:
   (a) α (b) β c) Zo , (*d*) Γ_L (e) v_p

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2. For transmission line **define** the reflection coefficient Γ_L.
3. A co-axial cable operate at **frequency 300MHz** having characteristic **impedance of 50Ω** is to feed a dipole antenna **of 75Ω**. ***Design the necessary matching unit***

Question Number (3) **(10 Points)**

1. **Determine the type of polarization and why for :**

$$E(z,t) = 2\cos(5 \times 10^8 t - 9z)\hat{x} + 4\sin(5 \times 10^8 t - 9z)\hat{y}\ (V/m)$$

2. Suppose we have a $\lambda/2$ transmission line having **Zo = 75 Ω**. Find **Zi** when:

   (a) $Z_L \rightarrow \infty$,

   (b) $Z_L = 0$,

   (c) $Z_L = 3+j10$

---

3. **An ideal ($\lambda/8$) Short circuit T.L has characteristic impedance of 75Ω and operates at frequency of 100MHz.**

   (a) Calculate the reflection coefficient Γ_L

   (b) Find the value of **Zi**

   (c) Find the value of the equivalent **capacitor** or **inductor assume** $f = 100MHz$

Question Number (4) **(10 Points)**

1. **With diagram** compare between **TEM** , **TM** and **TE** waves.

2. A Rectangular waveguide filled with a material whose **$\epsilon r = 2.25$** with dimensions of **a = 2 cm** and **b = 1.4 cm**. operate below **30 GHz** Calculate:

   (a) The cutoff frequency of the dominant mode

   (b) The cutoff wave number

   (c) The phase shift constant

   (d) The wave impedance

   (e) Does this wave guide support TE_{00} **and why?**

With my best wishes *Dr / Nessim Mahmoud*

Tanta University
Anatomy and physiology Departments
Bio-medical engineering (BME)
28/6/2025
20 MCQs (20 marks) – 5 Questions (20 marks)

Faculty of Engineering
2nd semester final exam
40 marks
Time: 2H 5 Pages

All questions to be answered

Question (1): Answer the following questions (20marks)

Q1. List the types of pennated muscle fibers and their character.

(4 marks)

Q2. List the lobes of the cerebrum. Mention one primary function for each lobe. (4 marks)

Q3. Mention sites of unipolar chest leads. (4 marks)

Q4. Define basal metabolic rate and mention its basal conditions. (4 marks)

Q5. Define tidal volume and vital capacity. (4 marks)

Question (2): Choose the best correct answer: (20 marks, one mark each)

1. **The direction of movement in skeletal muscles is usually:**
   A. From origin to insertion
   B. From insertion to origin
   C. Bidirectional
   D. No movement

2. **The force of contraction in skeletal muscles having parallel arrangement of their fibers compared to muscles with different fiber arrangement:**
   A. The force of contraction is great
   B. The force of contraction is less
   C. No force difference
   D. No contraction

3. **The structure in the heart that tightens the valve closure during contraction of the ventricles is:**
   A. Coronary artery
   B. Papillary muscles and their corda tendinea
   C. Coronary sinus
   D. Atrial septum

4. **The mitral valve in the heart has:**
   A. One cusp
   B. Two cusps
   C. Three cusps
   D. Four cusps

5. **Gas exchange in the lung between air and blood occur in:**
   A. The trachea
   B. Main bronchi
   C. Bronchioles
   D. Alveoli

6. **The right lung has:**
   A. One lobe
   B. Two lobes
   C. Three lobes
   D. Four lobes

7. **The structure that closes over the larynx, preventing food from entering it during swallowing is:**
   A. Soft palate
   B. Hard palate
   C. Epiglottis
   D. Tongue

8. **The pancreas pours its secretions in:**
   A. Stomach
   B. Duodenum
   C. Ileum
   D. Large intestine

9.Which of the following ECG waves represent depolarization of postero-basal part of ventricle and pulmonary conus of right ventricle?
   A. S wave.
   B. Q wave.
   C. T wave.
   D. R

10. Which of the following is the heart rate of this ECG if the distance between 2R is 4 large squares?
   A. 103 b/m
   B. 60 b/m
   C. 75 b/ m
   D. 53 b/m

11. Which of the following decreasing the arterial blood pressure?
   A. Increase cardiac output.
   B. Hemorrhage.
   C. Exercise.
   D. Emotions.

12. What is the normal value of total lung capacity?

   A. 3000 ml
   B. 4500 ml.
   C. 1200 ml.
   D. 5700 ml.

13. **Which of the following represent the volume of the air inspired or expired in each respiratory cycle during rest?**

A. The tidal volume
B. The inspiratory reserve volume
C. The expiratory reserve volume
D. The residual volume

14. **What is the normal value of inspiratory reserve volume?**

A. 3000 ml
B. 4500 ml.
C. 1200 ml.
D. 5700 ml.

15. **What is the normal value of residual volume?**

A. 3000 ml
B. 4500 ml.
C. 1200 ml.
D. 5700 ml.

16. **What is the physiological heat value of one gram of protein ?**

A. 9.3 C.
B. 4.1 C.
C. 5.3 C.
D. 4.8 C.

17. **What is the average value of basal metabolic rate in adults?**

A. 50 C/ m^2/ hour.
B. 30 C/ m^2/ hour.
C. 40 C/ m^2/ hour.
D. 20 C/ m^2/ hour.

18. What is the amount of heat liberated from oxidation of foodstuffs outside the body?

A. Physiological heat value of food.
B. Basal metabolic rate
C. Metabolic rate
D. Physical heat value of food

19. What is the physical heat value of one gram of *Carbohydrate*

A. 9.3 C.
B. 4.1 C.
C. 5.3 C.
D. 4.8 C.

20. what is the normal value of glucose clearance?

A. 70/minute
B. zero/minute.
C. 110/minute
D. 140/minute.

With my best wishes

Committee of the exam: Prof Dr. Mohamed Elsaidy, Dr. Mayada Azab, Dr. Nesreen Mohammed

11 /6 /2025
Biomedical Engineering
Final Exam, Cell Biology course

Tanta University
Faculty of Medicine
Histology & Microbiology Departments

Choose the correct answer (20 marks, each one mark):

1- Which of the following molecules form a double layer inside the cell membrane?

A- Phospholipids.
B- Integral proteins.
C- Peripheral proteins.
D- Carbohydrates.

2- Which of the following structures are long finger-like projections on the cell surface to increase the surface area?

A- Cilia.
B- Flagella.
C- Microvilli.

3- Which of the following structures represent the energy house in the cell?

A- Nucleus.
B- Mitochondria.
C- Cell membrane.
D- Lysosomes.

4- Calcium ions necessary for muscle contraction are present in muscle cells in:

A- SER.
B- Golgi.
C- RER.
D- Outer mitochondrial membrane.

5- DNA of the nucleus is duplicated in which of the following phases of interphase?

A- G1 phase.
B- S phase.
C- G2 phase.

6- Which of the following is correct regarding pseudostratified columnar ciliated epithelium?

A- They are present lining ducts of glands.
B- All cells rest on the basement membrane.
C- It is a type of stratified epithelium.
D- All cells reach the surface.

7- Which of the following sites is lined by transitional epithelium?

A- Gastrointestinal tract.
B- Respiratory tract.
C- Urinary tract.
D- Skin.

8- Which of the following blood components are considered as true cells?

A- Erythrocytes.
B- Leukocytes.
C- Platelets.

9- Which of the following connective tissue cells has a flat nucleus with a signet ring shape?

A- Adipose cell.
B- Mast cell.
C- Plasma cell.
D- Macrophage.

10- What is the special stain for demonstration of reticulocytes?

A- Leishman Stain
B- Brilliant Cresyl Blue
C- Sudan III

11- Which of the following blood cells contain specific granules with crystalline dense cores?

A- Erythrocytes.
B- Lymphocytes
C- Eosinophils.
D- Monocytes.

12- Which of the following represents the dense connective tissue that surrounds the bundles of skeletal muscle fibers?

A- Perimysium
B- Endomysium
C- Epimysium

13- Which of the following is a character of cardiac muscle?

A- Long cylindrical multinucleated cell.
B- Fusiform cell with a central nucleus.
C- Short cylindrical multinucleated cell.
D- Branching cell with one or two central nuclei.

14- What is the sarcomere?

A- Smooth endoplasmic reticulum in muscle.
B- The cytoplasm of muscle.
C- The portion of the myofibril between two successive Z lines.

15- Which of the following organelles are a prominent component in the nerve axon?

A- Golgi apparatus.
B- Neurofibrils.
C- RER.
D- Nissle's granules.

16- Gram staining differentiates bacteria based on:

A- Presence of capsule
B- Cell wall thickness and composition
C- Ability to form endospores

D- Metabolic activity

17- Which of the following is a characteristic feature of bacterial endospores?

A- Active metabolism
B- Sensitivity to heat and chemicals
C- Resistance to harsh environmental conditions
D- Formation during bacterial growth

18- Which fungal structure is target for antifungal drug?

A- Hyphae
B- Mycelium
C- Spores
D- Ergosterol

19- Viruses differ from bacteria in that virus:

A- Contain both DNA and RNA
B- Have cell walls made of peptidoglycan
C- Cannot replicate without a host cell
D- Reproduce by binary fission

20- Which of the following best describes the steps of phagocytosis in order?

A- Ingestion → Chemotaxis → Digestion → Recognition
B- Recognition → Ingestion → Fusion → Digestion
C- Digestion → Ingestion → Recognition → Fusion
D- Fusion → Chemotaxis → Digestion → Recognition

Answer all the following questions (be specific):

1- Enumerate types of intercellular junctions and mention the width of intercellular space in each type (3 Marks).

A-.....

B-.....

C-.....

2- Enumerate four non membranous cell organelles (2 Marks).

A-.....

B-.....

C-.....

D- .....

3- Enumerate phases of mitosis (2 Marks).

A-.....

B-.....

C-.....

D- .....

4- Enumerate types of connective tissue fibers and give one stain for each type (3 Marks).

A-.....

B-.....

C-.....

5- Enumerate types of neuroglial cells (2 Marks).

A-.....

B-.....

C-.....

D- .....

6- Enumerate different modes of transmission of microorganisms? (3 marks)

A-.....

B-.....

C-.....

D-.....

E-.....

F-.....

7- Describe strategy for prevention of biofilm formation? (3 marks)

A-.....

B-.....

C-.....

8- Enumerate importance of carrier? (2 marks)

A-.....

B-.....

C-.....

GOOD LUCK