KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Sixth Semester

MECHATRONICS

U15MCE202 : Medical Mechatronics

COURSE OUTCOMES

CO1: Explain different measurement techniques used in physiological parameters measurement.

CO2: Describe the different sensors and transducer principles used in bio medical application

CO3: Describe the signal conditioning circuits used in biomedical engineering

CO4: Comment on various measurement systems used in diagnostics

CO5: Comment on various monitoring systems used in diagnostics

CO6: Differentiate the working of recorders and explain the advanced systems used in medicine.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching the following :   CO1 [K_2]

List I	List II
A. Beta waves	i. 4-8 Hz
B. Alpha waves	ii. 0.5 – 4 Hz
C. Theta waves	iii. 13-30 Hz
D. Delta waves	iv. 8-13 Hz

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	i	ii
c)	ii	iv	iii	i
d)	iii	i	ii	iv

2. ----------smallest change in the measurand that will result in a measurable change in the   CO2 [K_1]

transducer ouput

a) Threshold   b) offset

c) Hysteresis   d) Drift

3. Identify the main phenomena which take place in dialysis : 1. Diffusion, 2. Excretion, CO6 [K₂]

3. Ultrafiltration, 4. heating

a) 1,3   b) 1,4
c) 1,2   d) 2,3

4. Thermistor is a sensor used to measure   CO2 [K₁]
a) Light intensity   b) Displacement

c) Temperature   d) Force

5. **Assertion (A)** : Phonocardiograph is medically preferable than electronic stethoscopes to CO4 [K₂]
detect heart sounds.

Reason (R) : The phonocardiographs provide a recording of the waveforms of the heart
sounds. These waveforms are diagnostically more important and revealing than the sounds
themselves.

a) Both A and R are Individually true and   b) Both A and R are Individually true but
R is the correct explanation of A   R is not the correct explanation of A
c) A is true but R is false   d) A is false but R is true

6. DC amplifiers are generally of the negative feedback type and are used for   CO3 [K₂]
a) Medium gain applications   b) High gain applications

c) Low gain applications   d) Constant gain applications

7. The elements of cardiac conduction system are 1. SA node, 2. Bundle of His, 3. Atrial CO1 [K₂]
muscle 4. AV node. Find the Normal conduction pathway of human heart

a) 2-3-4-1   b) 1-3-2-4
c) 3-4-2-1   d) 4-1-3-2

8. Indicator Dilution Method and Dye Dilution Methods are used to measure   CO5 [K₁]

   a) Cardiac Output   b) Blood pressure

   c) Tissue temperature   d) Pulmonary Function

9. **Assertion** (A): Phonocardiograph is medically preferable than electronic stethoscopes to detect heart sounds.   CO4 [K₂]

   Reason (R): The phonocardiographs provide a recording of the waveforms of the heart sounds. These waveforms are diagnostically more important and revealing than the sounds themselves

   a) Both A and R are Individually true and R is the correct explanation of A   b) Both A and R are Individually true but R is not the correct explanation of A

   c) A is true but R is false   d) A is false but R is true

10. Ventricular fibrillation is a serious cardiac emergency resulting from _____of the heart muscles.   CO5 [K₁]

   a) synchronous contraction   b) asynchronous expansion

   c) synchronous expansion   d) asynchronous contraction

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. Define action potential.   CO1 [K₁]

12. Define biosensor.   CO2 [K₁]

13. List out the biomedical applications of Nano sensors.   CO2 [K₁]

14. Define instrumentation amplifier.   CO3 [K₁]

15. Define differential amplifier.   CO3 [K₁]

16. Differentiate phonocardiography and Vector Cardiography.   CO4 [K₂]

17. Define plethysmography.	CO4	[K$_1$]
18. Define the principle of CT scanner.	CO5	[K$_1$]
19. Classify Cardiac pacemakers.	CO5	[K$_2$]
20. Define diathermy.	CO6	[K$_1$]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Explain ECG recording and interpretation with neat sketches.	CO1	[K$_2$]
22. Classify optical fibre sensors and explain its working principle with neat diagrams.	CO2	[K$_2$]
23. Explain the principle of biosensors with suitable diagrams.	CO2	[K$_2$]
24. Explain instrumentation amplifier with a neat circuit diagram.	CO3	[K$_2$]
25. Explain blood flow measurement using electromagnetic flow meter with a neat sketch.	CO4	[K$_2$]
26. Explain the basic components of MRI scanner with neat sketches.	CO5	[K$_2$]
27. Explain parallel flow dialyzers and hollow fibre haemodialyzer with neat diagrams.	CO6	[K$_2$]

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