KUMARAGURU college of technology
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Register Number:……..….

M.TECH DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

BIOTECHNOLOGY

P14BTE402: Biomedical Engineering and Clinical Research

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Consider the following statements relating to the determination of displacement by a potentiometric transducer CO1 [K4]

   1. Measuring input voltage
   2. Connecting measurand to the potentiometer
   3. Measuring output voltage
   4. Linear/rotator/translational movement

   The correct order is:

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

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

2. The device to measure electrical activity of the eyes is CO3 [K1]

   a) ECG b) EMG

   c) EOG d) EEG

3. Consider the following: CO2 [K3]

   1. Reynolds number
   2. Strain
   3. Viscosity
   4. Stress

   Which of the parameters are dimensionless?

   a) 2,3 b) 3,4

   c) 1,4 d) 1,2

4. Matching type item with multiple choice code CO1 [K3]

List I	List II
A. Passive transducer	i. Mixture of metal oxides like Mg, Ni, Co

B. RTD	ii. Piezoelectric transducer
C. Active transducer	iii. Wide operating range, high cost
D. Thermister	iv. Potentiometric tranducers

	A	B	C	D
i	1	2	3	4
ii	4	3	2	1
iii	3	4	2	1
iv	2	1	3	4

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

5. Consider the following stages of a Heart lung machine: CO2 [K3]
1. Oxygenator
2.Pump
3. Filter
4. Temperature controller
The correct sequence of the stages is:
a) 4,2,3,1
b) 4,2,1,3
c) 4,3,1,2
d) 2,1,4,3

6. Consider the following principles related to ultrasonic transducers: CO2 [K3]
1. Delay established
2.Ultrasound receiver
3. Ultrasound transmitter
4. Distance estimated
The correct sequence of the principle is:
a) 3-2-1-4
b) 3-4-1-2
c) 3-1-2-4
d) 3-2-4-1

7. Consider the two statements and comment: CO3 [K3]

Assertion (A): In a randomized double-blinded controlled trial the doctor knows and the patient don't know who gets the placebo

Reason (R): The doctor gets to know as he needs to know who is getting a drug for the purposes of better treatment

a) Both A and R are individually correct and R is the correct explanation of A
b) A is correct but R is wrong
c) Both A and R are wrong
d) R is correct but A is wrong

8. For brittle materials, the plastic region in a stress-strain plot is CO2 [K2]
a) Prolonged
b) Short
c) Non- existent
d) plateau

9. Consider the following statements: CO1 [K2]

1. Sensor is always an electronic device
2. Transducer is always an electronic device
3. Sensor does not contain a signal conditioning unit
4. Transducer is not needed for optical measurements

a) 1,2,3 b) 4 only

c) 2,3,4 d) 3 only

10. Which is the correct sequence with respect to Clinical trials? CO3 [K3]

I) Patients II) Efficacy III) pharmacodynamics, IV) healthy V) colunteers

a) IV, II, III, I b) II, III, IV, I

c) I, II, III, IV d) III, II, IV, I

PART B (10 x 2 = 20 Marks)

11. What is the range of Bourdon tube sensors? CO1 [K2]
12. Enumerate differences between Sensor from transducers. CO1 [K_3]
13. Name two materials used as artificial skin. CO2 [K1]
14. Blood is non-newtonion liquid analyze the statement. CO2 [K3]
15. Draw an Einthovan Triangle. Show the various leads and their interconnections thereof. CO3 [K2]
16. Draw the byepass circuit of a heart-lung machine. CO3 [K2]
17. Write a block diagram of ultrasound B-scan image formation. CO1 [K1]
18. Write a note on the Rotating anode x-ray generator. CO1 [K2]
19. How do Phase 1, 2 and 3 clinical trials differ? CO3 [K3]
20. Mention the roles of the regulatory bodies governing clinical trials. CO3 [K2]

PART C (6 x 5 = 30 Marks)

21. Elaborate the classification, dynamic range and working principle of capacitative transducers. Indicate their advantages and disadvantages. CO1 [K2]

22. Discuss the biomechanics of cortical and cancellar bone. CO2 [K2]

23. Discuss various factors that contribute to Blood reheology. Derive an equation for the Hagen-pousielle flow of blood. CO2 [K2]

24. Explain the instrumentation of ECG. Compare the normal and abnormal electrocardiograms with suitable diadrams. CO1 [K4]

25.	Give the block diagram of an demand triggered pacemaker and atrially triggered pacemaker. Explain the Circuit of AC and DC defibrillators (or) Lown waveform defibrillators.	CO1	[K2]
26.	During the conduct of a large clinical trial of a drug, preliminary analysis of results show that there were three times as many participants in the experimental group who experienced severe nausea and vomiting compared to the control group. Two of the cases were severe enough to require that the participants be hospitalized. This is despite the fact that the preliminary analysis shows that there may be a moderate benefit with the drug. What should be done?	CO3	[K6]

PART D (4 x 10 = 40 Marks)

27.	A transducer for detecting intraalveolar pressure is malfunctioning. Establish a protocol to trouble shoot the sensor. Draw a neat flowchart for the above purpose.	CO1	[K6]
28.	Explain in detail the instrumentation and working of radiographic imaging system.	CO1	[K_2]
29.	Describe the principle and working of MRI Scan. Explain its medical applications.	CO1	[K_3]
30.	Discuss the design and the quality control of clinical trials to get approval for a drug.	CO3	[K_4]

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