

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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## M. Sc. (Electronics) (Fourth Semester)

### EXAMINATION, July, 2022

#### (Elective Course)

#### BIOMEDICAL ELECTRONICS

| Paper Code |   |   |   |     |
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| ELC        | 4 | 0 | 4 | (C) |

Questions Booklet  
Series

A

Time : 1:30 Hours ]

[ Maximum Marks : 100

#### Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 60 questions. Examinee is required to answer any 50 questions in the OMR Answer-Sheet provided and not in the question booklet. If more than 50 questions are attempted by student, then the first attempted 50 questions will be considered for evaluation. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

#### परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 60 प्रश्न हैं। परीक्षार्थी को किन्हीं 50 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। यदि छात्र द्वारा 50 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 50 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

***(Only for Rough Work)***

1. Recording electrical activities associated with heart is known as ..... .
  - (A) EEG
  - (B) EOG
  - (C) EMG
  - (D) ECG
2. Which of the following is considered to be the primary pacemaker of the heart ?
  - (A) sino-atrial node
  - (B) atrio-ventricular node
  - (C) Purkinje fibres
  - (D) bundle of His
3. Atrio-ventricular node is located at ..... .
  - (A) upper part of the heart wall between the two atrial
  - (B) lower part of the heart wall above the two atrial
  - (C) lower part of the heart wall between the two atrial
  - (D) upper part of the heart wall above the two atrial
4. Buffer amplifier converts :
  - (A) low impedance signals to high impedance signals
  - (B) high impedance signals to low impedance signals
  - (C) a.c. impedance signals to d.c. impedance signals
  - (D) d.c. impedance signals to a.c. impedance signals
5. What biological measurement is done by the Spirometer ?
  - (A) Blood pressure measurement
  - (B) Blood flow measurement
  - (C) Respiratory volume measurement
  - (D) Blood sugar measurement
6. Electrodes to measure EEG are placed on ..... .
  - (A) Forehead
  - (B) Scalp
  - (C) Cheek
  - (D) Ears

7. The following are properties of ultrasound waves as applied in medical imaging, except :
- (A) They are longitudinal.
  - (B) They are acoustic.
  - (C) They are electromagnetic.
  - (D) They depend upon the medium through which it propagates.
8. What is the function of a Nebulizer as a respiratory therapy ?
- (A) It is a device used to administer medication in the form of mist inhaled into the lungs and used for treatment of asthma and other pulmonary disorders.
  - (B) It is a device used to remove liquid or gases by suction from the body.
  - (C) It is a equipment used to increase humidity of the inspired air.
  - (D) None of the above
9. What is tidal volume with regard to lung capacities ?
- (A) It is the extra volume that can be inspired.
  - (B) It is the maximum volume of the gas that can be expelled from the lungs by forceful expiration after maximum inspiration.
  - (C) It is the volume of gas inspired or expired during each respiration cycle.
  - (D) It is the volume of air remaining in the lungs at the end of expiratory level.
10. All the following are methods of blood pressure measurement, except :
- (A) Sphygmomanometer
  - (B) Percutaneous method
  - (C) Hagen-Poiseuille analysis
  - (D) Catheterization

11. The following are methods of blood flow measurement, except :
- (A) Magnetic blood flow measurement
  - (B) Coriolis blood flow measurement
  - (C) Ultrasonic blood flow measurement
  - (D) Radiographic blood flow measurement
12. Which of the following statements is true about Needle electrodes ?
- (A) They are designed to measure bioelectric potentials near or within the cell.
  - (B) They are designed to penetrate the skin so that they can record biopotentials like EEG signals from the brain.
  - (C) They are designed to measure bionotentials from the surface of the skin.
  - (D) Typical examples include the metal microelectrodes and micropipette.
13. The capacitance of a passive capacitance transducer depends on the following factors, except :
- (A) Distance between the two parallel plates
  - (B) The area of the two parallel plates
  - (C) Relative dielectric constant
  - (D) Mass of the two parallel plates
14. The following are resistive passive transducers, except :
- (A) Strain gauge
  - (B) Potentiometer
  - (C) Linear Variable Differential Transformer (LVDT)
  - (D) Photodiode
15. Which one of the following is not a transducer ?
- (A) Thermocouple
  - (B) Photovoltaic
  - (C) Electro-oculogram
  - (D) Moving coil generator

16. The following are the major functional physiological systems of the body, except :
- (A) Cardiovascular system
  - (B) Respiratory system
  - (C) Electrocardiogram system
  - (D) Nervous system
17. What should be the frequency response of the amplifiers that are used for the amplification purpose of the input signal in medical devices ?
- (A) High frequency response
  - (B) Low frequency response
  - (C) Frequency response has no role to play in it
  - (D) Average frequency response
18. To achieve the ..... required for medical applications, the amplifier must have large values of coupling capacitance.
- (A) random frequency response
  - (B) high frequency response
  - (C) average frequency response
  - (D) low frequency response
19. Unit of mean platelet volume is expressed in :
- (A) Millilitres
  - (B) Femolitres
  - (C) Picolitres
  - (D) Decilitres
20. Modern instrument use ..... for intravascular oximetry.
- (A) Photodiode
  - (B) Red and infrared LEDs
  - (C) Optical fibre
  - (D) Phototransistor
21. BAW stands for :
- (A) Bulk Acoustic Wave
  - (B) Barrier Acoustic Wave
  - (C) Barrier Avoiding Wave
  - (D) Bulk Activated Wave
22. CT stands for :
- (A) Controlled Tomography
  - (B) Computerized Tomography
  - (C) Converted Tomography
  - (D) Comparison Tomography

23. Process of changing resting potential to action potential is known as :
- (A) Polarization
  - (B) Re-polarization
  - (C) De-polarization
  - (D) Uni-polarization
24. Which of the following is used in Tomography ?
- (A) X-ray
  - (B) Gamma ray
  - (C) UV ray
  - (D) IR radiation
25. Which of the following amplifier circuitry is employed to reduce the hum noise generated the power supply in the ECG circuit ?
- (A) Band pass filter
  - (B) Low pass filter
  - (C) Notch filter
  - (D) High pass filter
26. The volume of blood within the dialyzer is known as ..... .
- (A) secondary volume
  - (B) quarterly volume
  - (C) priming volume
  - (D) residual volume
27. What do biosensors do ?
- (A) Detect the user's impulses
  - (B) Detect the user's memory
  - (C) Detect the user's intension
  - (D) Detect the user's reflexes
28. Which of the following displacement sensors is known to have a high sensitivity and relatively large measurement range ?
- (A) Strain gauge
  - (B) Capacitive transducer
  - (C) LVDT
  - (D) Piezoelectric sensor
29. In diagnostic X-ray imaging, the following is a not part of EM radiation :
- (A) Photoelectric effect
  - (B) Characteristic radiation production
  - (C) Compton scattering
  - (D) Pair-production
30. Which of the following temperature sensors is used in contact-type digital thermometer for measuring body temperature ?
- (A) Thermocouple
  - (B) Thermistor
  - (C) RTD
  - (D) Infrared LED-photodetector pair

31. Which of the following glands produces the thyroid stimulating hormones (TSH) ?
- (A) Thyroid
  - (B) Parathyroids
  - (C) Pituitary
  - (D) Pineal
32. Any change in NSR is known as :
- (A) Bradycardia
  - (B) Arrhythmia
  - (C) Asthma
  - (D) Syncope
33. The electrode used in defibrillators is called :
- (A) Ear-clip
  - (B) Micropipet
  - (C) Paddles
  - (D) None of the above
34. Which of the following techniques is used in blood flow meter ?
- (A) Ultrasonic
  - (B) Magnetic
  - (C) Thermal convection
  - (D) All of the above
35. Source of bioelectric potential is ..... in nature.
- (A) Electronic
  - (B) Electric
  - (C) Ionic
  - (D) Mechanical
36. The principal ion that is not involved with the phenomena of producing cell potentials is .....
- (A) Sodium
  - (B) Potassium
  - (C) Chlorine
  - (D) Hydrogen
37. Deep-seated electrodes indicates the electric potential difference arising ..... the living tissues or cells.
- (A) Inside
  - (B) Outside
  - (C) Around
  - (D) Adjacent



38. In floating electrodes metal electrode does not make direct contact with the skin.
- (A) True  
(B) False
39. Which of the following is a preferred electrode for measuring EMG ?
- (A) Surface electrodes  
(B) Needle electrodes  
(C) Pregelled electrodes  
(D) Scalp electrodes
40. Generally what is the material of needle electrodes ?
- (A) Stainless steel  
(B) Copper  
(C) Lead  
(D) Iron
41. Glass microcapillaries are preferred over metallic electrodes because of the former .....
- (A) polarizes with input current  
(B) does not have sustainable current carrying capacity  
(C) has less contact surface area  
(D) has sustainable current carrying capacity
42. Which of the following has the widest range of temperature measurement ?
- (A) RTD  
(B) Thermocouple  
(C) Thermistor  
(D) Mercury thermometer
43. The junction at a higher temperature in thermocouple is termed as measuring junction.
- (A) True  
(B) False
44. The frequency range of ECG is :
- (A) 0.05-150 Hz  
(B) 500-1500 Hz  
(C) 5-500 kHz  
(D) 0.5-150 MHz
45. The branch of medicine that deals with the provision and use of artificial devices such as splints and braces is .....
- (A) prosthetics  
(B) orthotics  
(C) laproscopic  
(D) augmentative communication

46. What is the pH of Arterial blood ?
- (A) 7.25
  - (B) 7.30
  - (C) 7.35
  - (D) 7.40
47. .... will reject any common mode signal that appears simultaneously at both amplifier input terminal.
- (A) a.c. coupled amplifiers
  - (B) d.c. amplifiers
  - (C) carrier amplifiers
  - (D) differential amplifiers
48. What is the pH range of intracellular fluid ?
- (A) 7.0 to 7.2
  - (B) 7.3 to 7.35
  - (C) 7.35 to 7.45
  - (D) 7.50 to 7.60
49. Which task is performed after the ventricular fibrillation detection in automated arrhythmia monitoring system ?
- (A) Noise detection
  - (B) Beat labelling
  - (C) Atrial fibrillation detection
  - (D) Rhythm definition
50. EEG electrodes are smaller in size than ECG electrodes.
- (A) True
  - (B) False
51. Pure-tone audiometers usually generate test tones in octave steps from .....
- (A) 125 to 800 Hz
  - (B) 125 to 8000 Hz
  - (C) 25 to 8000 Hz
  - (D) 15 to 800 Hz
52. The unit of sensitivity of an electrocardiograph .....
- (A) m/mV
  - (B) mm/V
  - (C) mm/mV
  - (D) m/V

53. Speech audiometry normally allows measurements to be made within the frequency range of ..... .
- (A) 300—3000 Hz
  - (B) 30—300 Hz
  - (C) 300—3000 kHz
  - (D) 3—30 kHz
54. The volume of blood outside the dialyzer is known as priming volume.
- (A) True
  - (B) False
55. What is the role of Cupraphan in haemodialysis ?
- (A) used to check conductivity of dialyzer
  - (B) used as membrane
  - (C) used to check blood leakage
  - (D) not at all used
56. Which of the following is the property of instrumentational amplifier ?
- (A) Extremely low input impedance
  - (B) High bias and offset currents
  - (C) Low slew rate
  - (D) Very high CMRR
57. The range of FHR measurement due to substitution logic is between ..... bpm.
- (A) 20-220
  - (B) 60-260
  - (C) 40-240
  - (D) 0-200
58. The blood is a good conductor of electricity.
- (A) True
  - (B) False
59. Which of the following materials is used to improve electrical contact ?
- (A) Silver Tungsten
  - (B) Electrode Jelly
  - (C) Silver Graphite
  - (D) Copper Tungsten
60. What are generally designed to have a very high value of input impedance to take care of high electrode impedance ?
- (A) Montages
  - (B) Electrodes
  - (C) Preamplifiers
  - (D) Filters

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the most correct/appropriate answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ☒ (B) (C) (D)

Q. 2 (A) (B) ☒ (C) (D)

Q. 3 (A) ☒ (B) (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से एक सबसे सही अथवा सबसे उपयुक्त उत्तर छोटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ☒ (B) (C) (D)

प्रश्न 2 (A) (B) ☒ (C) (D)

प्रश्न 3 (A) ☒ (B) (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।