

Roll No.

Question Booklet Number

O. M. R. Serial No.

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M. Sc. (Electronics) (Fourth Semester)
(NEP) EXAMINATION, 2025-26
BIOMEDICAL ELECTRONICS (ELECTIVE)

Paper Code							
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Questions Booklet
Series

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Time : 1:30 Hours]

[Maximum Marks : 75

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. 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 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। 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. Echoencephalography is mainly used to examine :
 - (A) Brain structures
 - (B) Cardiac valves
 - (C) Lung tissues
 - (D) Bone density
2. Echocardiography is used to study :
 - (A) Brain activity
 - (B) Heart structure and motion
 - (C) Lung capacity
 - (D) Kidney filtration
3. The piezoelectric crystal in ultrasound transducers converts :
 - (A) Electrical energy into mechanical vibrations and vice versa
 - (B) Magnetic energy into sound
 - (C) Heat energy into electricity
 - (D) Optical signals into electrical signals
4. Typical frequency range used in medical ultrasound imaging is :
 - (A) 20 Hz – 20 kHz
 - (B) 1 – 20 MHz
 - (C) 1 – 10 kHz
 - (D) 100 – 500 Hz
5. Ultrasonic diagnostic imaging is based on :
 - (A) Reflection of high frequency sound waves
 - (B) Absorption of infrared radiation
 - (C) Nuclear decay
 - (D) Magnetic induction
6. Nebulizers convert liquid medication into :
 - (A) Solid particles
 - (B) Fine aerosol mist
 - (C) Electrical signals
 - (D) Heat energy
7. An inhalator is used to :
 - (A) Measure respiration
 - (B) Deliver medication directly into lungs
 - (C) Measure oxygen saturation
 - (D) Record lung sounds
8. Negative pressure ventilators operate by :
 - (A) Expanding chest using negative pressure outside body
 - (B) Pumping air directly into lungs
 - (C) Increasing blood flow
 - (D) Measuring lung capacity

9. Positive pressure ventilators work by :
- (A) Creating negative pressure outside chest
 - (B) Forcing air into lungs
 - (C) Removing oxygen from lungs
 - (D) Compressing diaphragm
10. Mechanical ventilators control :
- (A) Only oxygen concentration
 - (B) Breathing rate and tidal volume
 - (C) Blood pressure
 - (D) Heart rhythm
11. A respirator differs from a ventilator mainly in :
- (A) Size
 - (B) Method of breathing assistance
 - (C) Electrical supply
 - (D) Cost
12. Ventilators are primarily used to :
- (A) Monitor blood pressure
 - (B) Assist or replace spontaneous breathing
 - (C) Measure lung volume
 - (D) Record ECG
13. Respiratory rate of a healthy adult is approximately :
- (A) 5-10 breaths/min
 - (B) 12-20 breaths/min
 - (C) 30-40 breaths/min
 - (D) 50-60 breaths/min
14. A pneumotachograph measures :
- (A) Blood pressure
 - (B) Airflow rate in respiration
 - (C) Oxygen concentration
 - (D) Body temperature
15. Residual volume refers to :
- (A) Air remaining in lungs after maximum expiration
 - (B) Air inhaled during normal breathing
 - (C) Air exhaled during forced expiration
 - (D) Air inhaled during forced inspiration
16. Vital capacity of lungs is the sum of :
- (A) Tidal volume + inspiratory reserve + expiratory reserve
 - (B) Residual volume + tidal volume
 - (C) Inspiratory reserve + residual volume
 - (D) Expiratory reserve + residual volume
17. The volume of air inhaled or exhaled during normal breathing is called :
- (A) Vital capacity
 - (B) Residual volume
 - (C) Tidal volume
 - (D) Inspiratory reserve volume

18. Spirometry is mainly used to evaluate :
- (A) Cardiac output
 - (B) Pulmonary function
 - (C) Blood pressure
 - (D) Brain activity
19. The instrument used to measure lung volumes and capacities is :
- (A) Spirometer
 - (B) Sphygmomanometer
 - (C) Electrocardiograph
 - (D) Thermistor
20. The primary function of the respiratory system is to :
- (A) Pump blood
 - (B) Exchange oxygen and carbon dioxide
 - (C) Produce hormones
 - (D) Digest food
21. The first heart sound (S1) is mainly caused by :
- (A) Opening of semilunar valves
 - (B) Closure of AV valves
 - (C) Opening of AV valves
 - (D) Closure of pulmonary valves
22. Heart sounds are recorded using :
- (A) Electrocardiograph
 - (B) Phonocardiograph
 - (C) Electroencephalograph
 - (D) Spirometer
23. Blood flow measurement using electromagnetic flowmeter is based on :
- (A) Faraday's law of electromagnetic induction
 - (B) Ohm's law
 - (C) Kirchhoff's law
 - (D) Coulomb's law
24. The Korotkoff sounds are associated with measurement of :
- (A) Heart rate
 - (B) Blood pressure
 - (C) Blood flow
 - (D) Lung volume
25. Blood pressure is commonly measured using :
- (A) Sphygmomanometer
 - (B) Spirometer
 - (C) Thermometer
 - (D) ECG

26. The normal resting heart rate for adults is approximately :
- (A) 20-40 bpm
 - (B) 60-100 bpm
 - (C) 120-160 bpm
 - (D) 200 bpm
27. Stress testing ECG is mainly used to detect :
- (A) Lung disease
 - (B) Coronary artery disease
 - (C) Kidney failure
 - (D) Liver malfunction
28. Holter monitoring refers to :
- (A) Short-term ECG recording
 - (B) Continuous 24-hour ECG recording
 - (C) Blood pressure monitoring
 - (D) EEG monitoring
29. Vector cardiography records :
- (A) Electrical vector magnitude and direction of heart activity
 - (B) Blood pressure variations
 - (C) Brain electrical signals
 - (D) Muscle contraction
30. The number of chest leads in a standard ECG is :
- (A) 2
 - (B) 4
 - (C) 6
 - (D) 8
31. Standard limb leads used in ECG are :
- (A) I, II, III
 - (B) V1, V2, V3
 - (C) aVR, aVL, aVF
 - (D) I, aVR, V6
32. Which electrode material is commonly used in ECG recording ?
- (A) Copper
 - (B) Silver/Silver chloride
 - (C) Aluminium
 - (D) Gold
33. The main function of an ECG amplifier is to :
- (A) Increase heart rate
 - (B) Amplify small cardiac electrical signals
 - (C) Generate ECG signals
 - (D) Measure blood pressure
34. The frequency range of a typical ECG signal is approximately :
- (A) 0.05-150 Hz
 - (B) 1-10 kHz
 - (C) 10-20 kHz
 - (D) 100-500 kHz
35. The electrical activity of the heart is recorded using :
- (A) EEG
 - (B) EMG
 - (C) ECG
 - (D) PCG

36. The electrode-electrolyte interface produces :
- (A) Polarization potential
 - (B) Magnetic flux
 - (C) Optical emission
 - (D) Mechanical vibration
37. Needle electrodes are mainly used for recording :
- (A) Brain activity
 - (B) Muscle activity
 - (C) Heart activity
 - (D) Skin resistance
38. Body surface electrodes are commonly used in :
- (A) ECG recording
 - (B) DNA sequencing
 - (C) Blood analysis
 - (D) X-ray imaging
39. A microelectrode is mainly used for :
- (A) Surface measurements
 - (B) Intracellular potential measurements
 - (C) Blood pressure measurement
 - (D) Temperature measurement
40. Evoked potentials are electrical signals produced in response to :
- (A) Mechanical stimulus
 - (B) External sensory stimulus
 - (C) Thermal stimulus
 - (D) Chemical stimulus
41. EMG measures electrical activity of :
- (A) Muscles
 - (B) Brain
 - (C) Heart
 - (D) Liver
42. EEG is primarily used to measure electrical activity of :
- (A) Heart
 - (B) Brain
 - (C) Muscles
 - (D) Lungs
43. The bioelectric signal recorded from the heart is called :
- (A) EEG
 - (B) EMG
 - (C) ECG
 - (D) EOG

44. Action potential propagation in nerve fibers occurs due to :
- (A) Ion exchange across cell membrane
 - (B) Electron flow through cytoplasm
 - (C) Thermal conduction
 - (D) Optical transmission
45. The resting membrane potential of a typical nerve cell is approximately :
- (A) + 70 mV
 - (B) - 70 mV
 - (C) + 120 mV
 - (D) - 120 mV
46. Strain gauge used for physiological measurements is an example of :
- (A) Passive transducer
 - (B) Active transducer
 - (C) Optical transducer
 - (D) Digital sensor
47. An active transducer is one that :
- (A) Requires external power for operation
 - (B) Generates its own electrical output without external power
 - (C) Operates only at low frequencies
 - (D) Works only with digital systems
48. Which component converts physiological variables into measurable electrical signals ?
- (A) Amplifier
 - (B) Transducer
 - (C) Oscillator
 - (D) Filter
49. The man-instrumentation system mainly studies :
- (A) Human interaction with measuring instruments
 - (B) Chemical reactions in the body
 - (C) Drug synthesis
 - (D) Genetic engineering
50. Biomedical engineering primarily deals with :
- (A) Application of engineering principles to medicine and biology
 - (B) Manufacturing of pharmaceuticals
 - (C) Hospital administration
 - (D) Genetic modification only

51. MRI provides excellent imaging of :
- (A) Soft tissues
 - (B) Bones only
 - (C) Teeth only
 - (D) Air cavities
52. In PET imaging, annihilation of positrons produces :
- (A) Two gamma photons
 - (B) Ultrasound waves
 - (C) Magnetic pulses
 - (D) Infrared light
53. Resolution in ultrasound imaging depends mainly on :
- (A) Frequency of ultrasound waves
 - (B) Blood pressure
 - (C) Magnetic field strength
 - (D) Tissue temperature
54. Contrast agents in CT imaging are mainly used to :
- (A) Enhance visibility of tissues
 - (B) Reduce radiation
 - (C) Increase ultrasound speed
 - (D) Decrease scanning time
55. Which imaging technique does NOT use ionizing radiation ?
- (A) MRI
 - (B) CT scan
 - (C) X-ray imaging
 - (D) Nuclear imaging
56. The RF coil in MRI is used to :
- (A) Transmit and receive radiofrequency signals
 - (B) Generate X-rays
 - (C) Produce ultrasound
 - (D) Measure temperature
57. Hydrogen nuclei are mainly used in MRI because :
- (A) They are abundant in body tissues
 - (B) They emit gamma rays
 - (C) They produce X-rays
 - (D) They absorb ultrasound
58. The main magnetic field used in MRI scanners is typically :
- (A) 0.1-3 tesla
 - (B) 1-10 gauss
 - (C) 100 tesla
 - (D) 1 millitesla
59. MRI Imaging is based on the principle of :
- (A) Nuclear magnetic resonance
 - (B) Ultrasonic reflection
 - (C) X-ray absorption
 - (D) Optical fluorescence

60. Gamma cameras used in nuclear imaging detect :
- (A) Gamma radiation from radioisotopes
 - (B) Infrared radiation
 - (C) Acoustic waves
 - (D) Magnetic flux
61. Pulse oximetry is used to measure :
- (A) Blood glucose
 - (B) Oxygen saturation of blood
 - (C) Lung capacity
 - (D) Air pressure
62. Respiratory monitoring in ICU often includes :
- (A) ECG only
 - (B) Oxygen saturation and respiration rate
 - (C) Blood sugar
 - (D) Body temperature only
63. Peak expiratory flow rate measures :
- (A) Maximum speed of expiration
 - (B) Oxygen concentration
 - (C) Heart output
 - (D) Blood flow
64. During expiration, lung volume :
- (A) Increases
 - (B) Decreases
 - (C) Remains constant
 - (D) Doubles
65. During inspiration, the diaphragm :
- (A) Moves upward
 - (B) Moves downward
 - (C) Remains stationary
 - (D) Vibrates
66. The diaphragm plays a major role in :
- (A) Circulation
 - (B) Breathing mechanics
 - (C) Digestion
 - (D) Neural conduction
67. Respiratory therapy equipment must be :
- (A) Non-sterile
 - (B) Biocompatible and sterile
 - (C) Magnetic
 - (D) Mechanical only
68. Aspirators in hospitals are mainly used for :
- (A) Removing mucus or fluids from airway
 - (B) Delivering oxygen
 - (C) Measuring lung volume.
 - (D) Monitoring heart rate

69. Dry medical gases may cause :
- (A) Increased oxygen level
 - (B) Airway irritation and dryness
 - (C) Reduced breathing rate
 - (D) Increased blood pressure
70. Humidifiers are used in respiratory therapy to :
- (A) Dry inhaled air
 - (B) Add moisture to inhaled gases
 - (C) Increase oxygen pressure
 - (D) Measure lung pressure
71. A major requirement of ICU monitoring systems is :
- (A) High noise level
 - (B) Continuous real-time monitoring
 - (C) Low sensitivity
 - (D) Manual recording only
72. Non-invasive blood pressure measurement commonly uses :
- (A) Oscillometric method
 - (B) Optical method
 - (C) Nuclear method
 - (D) Thermal method
73. The T wave in ECG represents :
- (A) Atrial depolarization
 - (B) Ventricular depolarization
 - (C) Ventricular repolarization
 - (D) Atrial repolarization
74. The waveform displayed on ECG corresponding to ventricular depolarization is :
- (A) P wave
 - (B) QRS complex
 - (C) T wave
 - (D) U wave
75. A defibrillator is used to :
- (A) Record ECG signals
 - (B) Deliver high-energy shock to restore heart rhythm
 - (C) Measure blood flow
 - (D) Monitor respiration
76. An artificial pacemaker produces :
- (A) Mechanical pulses
 - (B) Electrical impulses
 - (C) Magnetic waves
 - (D) Optical pulses

77. A pacemaker is primarily used to :
- (A) Increase blood pressure
 - (B) Regulate abnormal heart rhythms
 - (C) Measure ECG
 - (D) Monitor respiration
78. Calibration of patient monitoring equipment ensures :
- (A) Correct and accurate measurements
 - (B) Faster operation
 - (C) Lower cost
 - (D) Reduced signal amplification
79. Patient monitoring displays are mainly used to :
- (A) Store medical history
 - (B) Display real-time physiological signals
 - (C) Generate electrical signals
 - (D) Perform surgery
80. An intensive care unit (ICU) monitoring system typically measures :
- (A) ECG, respiration, blood pressure
 - (B) Only body temperature
 - (C) Only blood glucose
 - (D) Only brain signals
81. The amplitude of ECG signal recorded from body surface is approximately :
- (A) 1 mV
 - (B) 1 V
 - (C) 10 V
 - (D) 100 V
82. Which electrode type is used for intracellular recording ?
- (A) Surface electrode
 - (B) Needle electrode
 - (C) Microelectrode
 - (D) Plate electrode
83. Noise in biomedical signals mainly arises from :
- (A) Power line interference
 - (B) Nuclear radiation
 - (C) Cosmic rays only
 - (D) Optical reflections
84. Signal conditioning in biomedical instruments includes :
- (A) Amplification and filtering
 - (B) Mechanical processing
 - (C) Chemical synthesis
 - (D) Genetic coding

85. Biomedical transducers must primarily be :
- (A) Large sized
 - (B) Biocompatible
 - (C) High power
 - (D) Heavy
86. Major problem in measuring living systems is :
- (A) Biological variability
 - (B) High voltage signals
 - (C) Lack of sensors
 - (D) Absence of noise
87. Blood gas electrodes are used to measure :
- (A) Oxygen and carbon dioxide levels in blood
 - (B) Blood glucose
 - (C) Blood pressure
 - (D) Hemoglobin only
88. pH electrodes are based on :
- (A) Optical sensing
 - (B) Ion-selective glass membrane
 - (C) Magnetic sensing
 - (D) Thermal sensing
89. A reference electrode is mainly used to :
- (A) Provide stable potential reference
 - (B) Amplify signals
 - (C) Filter signals
 - (D) Generate pulses
90. The Ag/AgCl electrode is widely used because it has :
- (A) High polarization
 - (B) Stable half-cell potential
 - (C) High temperature sensitivity
 - (D) Optical properties
91. In nuclear medicine imaging, the patient is administered :
- (A) Radioactive tracer
 - (B) Magnetic dye
 - (C) Ultrasound gel
 - (D) X-ray contrast only
92. Emission Computed Tomography includes techniques such as :
- (A) PET and SPECT
 - (B) ECG and EEG
 - (C) CT and MRI
 - (D) EMG and PCG

93. The main advantage of CT over conventional X-ray imaging is :
- (A) Cross-sectional imaging
 - (B) Lower voltage requirement
 - (C) Use of sound waves
 - (D) Magnetic field usage
94. Computed Tomography (CT or CAT scan) produces images using :
- (A) Multiple X-ray projections reconstructed by computer
 - (B) Ultrasound echoes
 - (C) Magnetic resonance
 - (D) Infrared radiation
95. Which component controls the intensity of X-rays in an X-ray tube ?
- (A) Cathode filament current
 - (B) Anode rotation
 - (C) Detector gain
 - (D) Grid voltage
96. X-ray imaging mainly depends on differences in :
- (A) Tissue density and absorption
 - (B) Magnetic susceptibility
 - (C) Acoustic impedance
 - (D) Optical scattering
97. Medical X-rays are produced when :
- (A) High speed electrons strike a metal target
 - (B) Sound waves reflect from tissue
 - (C) Nuclear decay occurs
 - (D) Laser light interacts with atoms
98. B-mode ultrasound imaging provides :
- (A) Two-dimensional cross-sectional images
 - (B) One dimensional signal
 - (C) Three dimensional images
 - (D) Frequency spectrum
99. A-mode ultrasound imaging represents :
- (A) Amplitude vs. depth
 - (B) Brightness vs. time
 - (C) Color vs. frequency
 - (D) Phase vs. amplitude
100. Ophthalmic ultrasound scanning is used to diagnose :
- (A) Eye disorders
 - (B) Liver disease
 - (C) Heart block
 - (D) Lung infection

(Only for Rough Work)

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

Example :

Question :

- Q. 1 (A) ● (C) (D)
 Q. 2 (A) (B) ● (D)
 Q. 3 (A) ● (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 सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

- प्रश्न 1 (A) ● (C) (D)
 प्रश्न 2 (A) (B) ● (D)
 प्रश्न 3 (A) ● (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।