

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

Recruitment for the post of Technical Assistant (Bio Medical Engg)

[Ref – Recruitment Notice No./NITRR/R-1/Advt./2024/947 dated 04/03/2024]

Time Allowed: 3 hours

Maximum Marks: 100

Name of the Candidate: _____ App. No. _____

Serial Number of the Response Evaluation Sheet _____

Signature of Candidate

Signature of Invigilator

INSTRUCTIONS TO THE CANDIDATES:

1. This booklet consists of _____ pages and 100 questions. Please check that this Question Booklet does not have any missing or torn pages or items, if so, get it replaced by another Question Booklet.
2. You have to mark all your responses ONLY on the separate Response Sheet provided. It should not be folded or mutilated. No additional Response Sheet shall be provided.
3. Use only Black Ball point pen for filling all particulars of Question Booklet, Response Sheet as well as **darkening the circle** of the Response in the Response Sheet.
4. This Question Booklet **contains 100 Multiple Choice Questions**, and each question is followed by four alternative answer options for examples A, B, C and D out of **which only one most appropriate option is** to be chosen. You need to darken the most appropriate correct circle of the Response Sheet by black ball point pen.
5. For each question, darken only one circle on the Response Evaluation Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as invalid. **Cutting/ Alterations/ Corrections** are not permitted. Answers once darkened cannot be changed in the Response sheet. If you do not wish to attempt a question, leave all the circles in corresponding row blank and in such condition zero marks will be awarded for that question.
6. Every correct answer will be awarded 1 mark and **-0.25** will be deducted for each wrong answer. **No marks for non-attempted/invalid/cutting/alteration responses would be assigned.**
7. Use of **Electronic Gadgets**, Pager, Mobile Phone, Scientific Calculator etc. are strictly prohibited. Use of Unfair Means will lead to the cancellation of candidature. Do not carry any loose paper.
8. Blank spaces and blank pages at the end of this Booklet can be used for Rough Work.
9. Strictly adhere to disciplines during the course of examination and you are not permitted to leave the Examination Hall until the end of the test.
10. Return the Question Booklet and Response Sheet to the Invigilator after completion of examination, else your candidature treated as cancelled.

PART-A

1. Atal tunnel, the world's longest highway tunnel connects Manali with:
A. Shimla
B. Kullu
C. Lahaul-Spiti Valley
D. Jammu
2. Who was the first Prime Minister of India who did not face the Parliament during his tenure?
A. Charan Singh
B. Morarji Desai
C. Gulzari Lal Nanda
D. Lal Bahadur Shastri
3. Which year was the first World Environment Day held?
A. 1971
B. 1978
C. 1984
D. 1974
4. Which of the following is known as the 'Roof of the World'?
A. Pamir Knot
B. Kanchenjunga
C. Indira Col
D. Indira Point
5. Which ODI spin bowler recently took three consecutive 5-wicket hauls?
A. R Ashwin
B. Wanindu Hasaranga
C. Kuldeep Yadav
D. Shakib Al Hasan
6. The world's nation 5G mobile network was launched by which country?
A. Japan
B. USA
C. South Korea
D. Singapore
7. The correct synonym for the word FOSTERING is:
A. Ignoring
B. Neglecting
C. Safeguarding
D. Nurturing
8. Fill in the blanks with appropriate words to make the sentence meaningful and complete:
The health minister _____ the need to make the laparoscopic surgery available to the common people and _____ it's reach.
A. stressed, larger
B. share, enthusiast
C. underscored, widen
D. spotted, extend
9. Identify the correct spelling from following:
A. Bouquete
B. Bouquet
C. Boquet
D. Bouquette
10. Choose the correct statement from following:
A. My aunt who lives in Mumbai, is a doctor.
B. My aunt, who lives in Mumbai is a doctor.
C. My aunt, who lives in Mumbai, is a doctor.
D. My aunt who lives in Mumbai is a doctor.
11. Choose the appropriate correction for the underlined error in the sentence:
One must "keep themselves" abreast of current events, particularly while preparing for competitive exams.
A. Put themselves
B. Keep oneself
C. keep himself
D. No correction is required
12. Select the lettered pair out of four pair of words that expresses the relationship that is most similar to that of the capitalized pair:
RAIN: DRIZZLE::
A. Ignoring

- A. juggle : bounce
B. walk : run
C. run : jog
D. hop : shuffle
13. In a certain coding system MOTHER is coded as PQWJHT, how will you code SISTER?
A. VKUVHT
B. VKVVHU
C. VKVVHT
D. VKVVHS
14. A student got twice as many sums wrong as he got right. If he attempted 48 sums in all, how many did he solve correctly?
A. 16
B. 12
C. 18
D. 24
15. In the given four figures, three are similar in some respect, while one is different. Out of the four figures, select the figure which is different.
- 

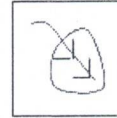
a



b



c



d
- A. a
B. b
C. c
D. d
16. Rana travels 10 km to the north, turns left and travels 4 km and then again turns right and covers another 5 km and then turns right and travels another 4 km. How far is he from the right starting point?
A. 5
B. 15
C. 4
D. 10
17. What is the full form of HTTP?
A. HyperText Transfer Process
B. HyperText Transfer Policy
C. HyperText Transfer Protocol
D. HyperText Transfer Procedure
18. What is the difference between a hard disk drive and a solid-state drive?
A. A hard disk drive is more durable than a solid-state drive.
B. A hard disk drive is faster than a solid-state drive.
C. A hard disk drive uses spinning disks to store data, while a solid-state drive uses flash memory to store data.
D. All of these
19. Which one of the following groups contains graphical file extensions?
A. TCP, JPG, BMP
B. GIF, TCE, WMF
C. JPG, CPX, GCM
D. JPG, GIF, BMP
20. What is the full form of PDF?
A. Portable document format
B. Paint document format
C. Print document file
D. Portable document file

PART-B

21. Which phenomenon is responsible for flow of current in a semiconductor?
A. Drift
B. Diffusion
C. Recombination
D. All of these
22. Which of the following is false for a common collector transistor?
A. Input impedance is high
B. It can be used for impedance matching
C. Output impedance is low
D. Power gain is high
23. If both the junctions of a transistor i.e., CB and EB are forward biased it will operate in which region?
A. Active
B. Cutoff

- C. Saturation
D. All of these
24. Which is true about FET?
A. Unipolar device
B. Voltage controlled device
C. Faster switching speed
D. All of these
25. The leakage current in common-emitter (CE) arrangement is that in common-base (CB) arrangement
A. More than
B. Less than
C. The Same as
D. None of the above
26. The CE amplifier circuits are preferred over CB amplifier circuits because they have:
A. Larger amplification factor
B. low amplification factor
C. High Input resistance and low output resistance
D. All of these
27. In a transistor as an amplifier, the reverse saturation current:
A. Doubles for every $^{\circ}\text{C}$ rise in temperature
B. Decreases linearly with temperature
C. Increase linearly with temperature
D. Doubles for every 10°C rise in temperature
28. The gain of a differential amplifier is 20000 and its CMRR is 80 dB. What is its common-mode gain?
A. 1
B. 4
C. 2
D. 0.5
29. Which of the following are the applications of an op-amp?
A. Current to voltage converters
B. Voltage followers
C. Logarithmic amplifiers
D. All of these
30. An unit impulse function in continuous time is defined as:
A. $\delta(t)=t$
B. $\delta(t)=1$
C. $\delta(t)=\infty, t=0$
 $=0, t\neq0$
D. $\delta(t)=0, t=0$
 $=\infty, t\neq0$
31. Which of the following statements is not true for a continuous time signal?
A. Sum of two periodic signals is always periodic
B. Any signal can be expressed as the sum of an odd and an even signal
C. Any periodic signal can be expressed as the sum of sinusoidal signals
D. None of these
32. Minimum number of NAND gates required to implement XOR gate is:
A. 3
B. 5
C. 4
D. None of these
33. Which among the following is the fastest of all the logic families?
A. TTL
B. RTL
C. ECL
D. CMOS
34. What will be the output of a D flip-flop if $D=1$ and clock is low?
A. Toggle between 0 and 1
B. No change
C. 0
D. 1
35. We can avoid race around conditions in digital logic circuits by using:
A. SR flip-flop
B. JK flip flop

- C. Master slave JK flip-flop
D. Full adder
36. Which of the following is the correct option that represents a universal gate:
A. NAND, NOR
B. AND, OR
C. XOR, XNOR
D. All of these
37. Which of the following is false about 8085 microprocessors?
A. It has 16 address lines
B. It is manufactured using PMOS technology
C. It is a 40 pin DIP chip
D. It is an 8-bit microprocessor
38. DAA instruction is used to perform which type of addition?
A. Binary addition
B. Octal addition
C. Excess-3 addition
D. BCD addition
39. 8051 series have how many 16-bit registers?
A. 1
B. 2
C. 0
D. 3
40. The Fourier transform of a unit step function is given by:
A. $F(j\omega) = 1/j\omega$
B. $F(j\omega) = j/\omega$
C. $F(j\omega) = 1/\omega$
D. None of these
41. Which of the following works on the principle of seebeck effect:
A. RTD
B. LVDT
C. Strain gauge
D. Thermocouple
42. Identify passive transducer from following:
A. Solar cell
B. Piezoelectric crystal
C. Capacitive microphone
D. Thermocouple
43. Which of the following acts as a detector in an Optical sensor:
A. Photo transistor
B. LDR
C. Photo diode
D. All of these
44. The principle of operation of LVDT is based on the variation of:
A. Reluctance
B. Mutual inductance
C. Self inductance
D. Permeance
45. Which of the following is done to convert a continuous time signal into discrete time signal?
A. Sampling
B. Modulation
C. Integration
D. Differentiation
46. Which analog-to-digital conversion method has a fixed conversion time?
A. Dual-slope analog-to-digital converter
B. Digital-ramp analog-to-digital converter
C. Successive-approximation analog-to-digital converter
D. Single-slope analog-to-digital converter
47. Which of the following functions is not performed by a signal conditioner?
A. Amplification
B. Filtering
C. Noise addition
D. Current to voltage conversion
48. The biopotentials generated by the muscles of the heart with time is called?
A. EEG
B. EMG

- C. ERG
D. ECG
49. The principal ion that is not involved with the phenomena of producing cell potentials is:
A. Hydrogen
B. Sodium
C. Potassium
D. Chlorine
50. What is the frequency range of ECG?
A. 20-350 Hz
B. 0.05-120 Hz
C. 5-120 Hz
D. 70-120 Hz
51. The voluntary contraction of skeletal muscles produces muscle potential in the range of:
A. 50 mV – 500 mV
B. 50 μ V – 5 mV
C. 0.05 μ V – 2 mV
D. 50 mV – 5 V
52. Which of the following is not a function of a pacemaker?
A. Generate images of the heart
B. Help the heart's chambers work together
C. Boost heart rate
D. Regulate heart rhythm
53. What is the role of a ventilator?
A. To measure oxygen saturation in the blood
B. To supply oxygen to patients
C. To assist in breathing
D. To filter waste and excess water from the blood
54. How does a pulse oximeter work?
A. It measures the oxygen saturation of the blood by analyzing the electrical signals from the blood
B. It measures the oxygen saturation of the blood by analyzing the heat emitted by the blood
C. It measures the oxygen saturation of the blood by analyzing the light absorption of the blood
D. It measures the oxygen saturation of the blood by analyzing the sound waves reflected by the blood
55. Which of these biosensors use the principle of heat released or absorbed by a reaction?
A. Potentiometric biosensor
B. Calorimetric biosensors
C. Piezo-electric biosensors
D. Optical biosensors
56. The purpose and working principle of a defibrillator is:
A. It restores a normal heartbeat by sending an electric pulse or shock to the heart
B. It uses sound waves to restore a normal heartbeat by sending an electric pulse or shock to the heart
C. It uses a magnetic field to restore a normal heartbeat by sending an electric pulse or shock to the heart
D. It uses light absorption to restore a normal heartbeat by sending an electric pulse or shock to the heart
57. The primary function of a stent in cardiovascular care is:
A. To regulate heart rhythm
B. To deliver medication to the heart
C. To open or widen narrowed or blocked arteries
D. None of these
58. If the heart rate is below 60, then the condition is called:
A. Bradycardia
B. Tachycardia
C. Heart blockage

- D. Arrhythmia
59. The systolic blood pressure refers to the:
- Force exerted on the walls during atrial relaxation
 - Force exerted on the walls during atrial contraction
 - Force exerted on the walls during ventricular relaxation
 - Force exerted on the walls during ventricular contraction
60. A graphic record of heart sounds is known as:
- Vectorcardiogram
 - Electroencephalogram
 - Phonocardiogram
 - Electrocardiogram
61. Which of the following can be the side effect of hemodialysis?
- Cramps
 - Weakness
 - Nausea
 - All of these
62. Which one of the following includes the blood tissue??
- Connective tissue
 - Epithelial tissue
 - Nervous tissue
 - Muscle tissue
63. The longest cell in the human body is:
- Gland cells
 - Nerve cells
 - Muscle cells
 - Bone cells
64. Which of the following organs contains a smooth muscle?
- Bronchi
 - Iris of eye
 - Uterus
 - All of these
65. Which of the following hypertension statements is not true?
- Hypertension raises the chances of a heart attack or stroke.
 - Lifestyle changes can help manage hypertension in some cases.
 - Headaches and dizziness are common symptoms of high blood pressure.
 - Hypertension is a medical term that refers to high blood pressure.
66. Which serves as a part of both the digestive system and the respiratory system.?
- Trachea
 - Oesophagus
 - Pharynx
 - Larynx
67. Homeostasis is defined as the:
- Tendency of an organism to change with change in environment.
 - Tendency of an organism to maintain stability by regulating the body's internal environment.
 - Regulatory control of hormones in the body.
 - Plant and animal extract used for homeopathic medicines.
68. When the body temperature rises above normal:
- Blood flow to the skin increases
 - Blood flow to the skin decreases
 - Vasoconstriction occurs
 - None of these
69. The layer of the skin that provides protection against bacteria, as well as chemical and mechanical injuries is the:
- Dermis
 - Subcutaneous layer
 - Epidermis
 - Sebum layer

70. A connective tissue which connects two bones to each other:
- Cartilages
 - Ligaments
 - Tendons
 - None of these
71. Skeletal muscle is responsible for:
- Voluntary movements of the body
 - Control of most of the involuntary movements
 - Carries out most of the involuntary processes such as digestion as well as pumping the blood through arteries
 - None of these
72. Elastic bundles of tissue that perform various functions is termed as:
- Tendons
 - Skin
 - Muscle
 - Joints
73. Which of the following pairs of endocrine glands is located in the brain?
- Pituitary and parathyroid
 - Hypothalamus and thymus
 - Thyroid and pineal
 - Hypothalamus and pineal
74. The part of the brain which controls the heart is:
- cerebrum
 - cerebellum
 - Medulla oblongata
 - Spinal cord
75. Blind spot in human eye can be located at the:
- Both ends of cornea
 - Junction of the optic nerve and the retina
 - Centre of eye lens
 - Left end of the ciliary muscles
76. The blood vessel containing deoxygenated blood is:
- Aorta
 - Pulmonary vein
 - Pulmonary artery
 - None of these
77. Which group of tissues covers, lines, and protects your organs?
- Connective tissue
 - Epithelial tissue
 - Muscle tissue
 - Nervous tissue
78. Which of the following material is highly elastic?
- Glass
 - Rubber
 - Steel
 - Brass
79. Select the statement which correctly relates to biocompatibility:
- a biocompatible material should have therapeutic characteristics
 - a biocompatible material should provide healing characters
 - a biocompatible material should have the exact dimensions as the damaged tissue or part
 - a material is considered as a biocompatible material as long as it causes no harm to the host body
80. Which of these is an example of a physical hydrogel?
- Gelatin
 - Poly(methylmethacrylate)
 - Poly(hydroxyethylmethacrylate)
 - None of these
81. Which of the following reasons explains the need for tissue engineering?
- Risk of disease transmission through donated organs
 - Limited availability of organ donors
 - High chances of immunological rejection of implanted graft

- D. All of these
82. Which of the following is used as a source of excitation in a confocal microscope?
- Electron beam
 - LASERS
 - MASERS
 - Mercury lamp
83. FTIR spectroscopy is:
- An absorbance technique
 - A reflectance technique
 - A dispersive technique
 - An emission technique
84. Which of the following statements is incorrect with respect to the rheological properties of blood?
- Blood behaves like a Bingham body
 - Blood is a non-Newtonian fluid
 - The viscosity of blood is constant with shear rate
 - Red blood cells are deformable
85. A metal used in orthopaedics has a composition of 65% Fe, 12% Ni, 19% Cr, 3% Mo, 1% Mn. What is it??
- F90 Co—Cr alloy
 - 316 L stainless steel
 - F-25 Co—Cr alloy
 - Ti6—A14—V alloy
86. A Shape memory alloy can have possible application in:
- Contact lenses
 - Bone plates
 - Total hip prosthesis
 - Brain electrodes
87. The correct statement for the Voigt-kelvin model of viscoelastic materials:
- It is a parallel combination of a spring and a dash-pot
 - It is a series combination of a spring and a dash-pot system
 - It is a parallel combination of a two dash-pots
 - It is a parallel combination of two springs
88. Which among the following is not true for cortical bones:
- They are made up of trabeculae
 - They are also called compact bones
 - They fill the outer layer of most bones
 - It forms the shaft or diaphysis of long bones
89. Bernoulli's principle is based on the:
- Law of conservation of energy
 - Flow continuity equation
 - Both A and B
 - None of these
90. Which is a false statement about Laminar blood flow:
- Follows the parabolic path
 - Shows linear relationship with pressure
 - Is streamlined and noiseless
 - Follows the irregular varying path
91. In which region of the load-deformation relationship of bone do microfractures of the tissue begin to occur?
- Plastic
 - Elastic
 - Failure
 - Initial
92. The basic functional unit of compact bone is:
- Collagen
 - Extracellular matrix
 - Osteon
 - Osteoblast
93. Which term describes the force due to the combination of tension and compression?
- Torsion
 - Bending
 - Compression

D. Shear

94. Which is/are the significant features of an implant biomaterial?

- A. Modulus of elasticity comparable to bone
- B. High tensile and compressive strength to prevent fractures and improve functional stability
- C. Biocompatible
- D. All of the above

95. Which of the following is not a joint classification?

- A. Synovial
- B. Cartilaginous
- C. Connective
- D. Fibrous

96. Which of the following is a hinge joint?

- A. Knee joint
- B. Between atlas and axis
- C. Between carpal and metacarpal of thumb
- D. Between the carpals

97. Which of these is not a major ability of atomic force microscopy?

- A. Force measurement
- B. Manipulation
- C. Topographic imaging
- D. Pressure measurement

98. Which of the following is used in an electron microscope?

- A. Magnetic fields
- B. Light waves
- C. Electron beams and magnetic fields
- D. Electron beams

99. Which of the following is a characterization technique used to measure Young's modulus of a biomaterial?

- A. Compression test
- B. Tensile test
- C. Three- and four-point bend test

D. Calculation from stress-strain curve

100. The sequence that correctly depicts the flow of blood through the heart to the lungs in order for gas exchange to occur.

- A. Right atrium, right ventricle, pulmonary artery, lungs
- B. Right atrium, right ventricle, lungs, pulmonary artery
- C. Right ventricle, Right atrium, pulmonary artery, lungs
- D. Right atrium, right ventricle, pulmonary artery, lungs