

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

Recruitment for the post of Technical Assistant (Electrical Engg)

[Ref – Recruitment Notice No./NITRR/R-1/Advt./2023/161 dated 13.07.2023]

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 11 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 (20 Marks)

1. Which one of the following ports is the oldest port in India?
 - A. Mumbai Port
 - B. Chennai Port
 - C. Kolkata Port
 - D. Vishakhapatnam Port
2. Where was the electricity supply first introduced in India?
 - A. Mumbai
 - B. Dehradun
 - C. Darjeeling
 - D. Chennai
3. The hottest planet in the solar system?
 - A. Earth
 - B. Venus
 - C. Mars
 - D. Jupiter
4. Country that has the highest in Barley Production?
 - A. China
 - B. India
 - C. Russia
 - D. France
5. Pointing to a photo, Dinesh said, "His father is only son of my mother". The photo belongs to:
 - A. Dinesh
 - B. Dinesh's brother
 - C. Dinesh's father
 - D. Dinesh's son
6. Which word does NOT belong with the others?
 - A. tulip
 - B. rose
 - C. bud
 - D. daisy
7. When a die is rolled, the probability of landing with 2 is?
 - A. $\frac{3}{6}$
 - B. $\frac{1}{6}$
 - C. $\frac{2}{6}$
 - D. $\frac{5}{6}$
8. The average age of a group of 5 students was 10. The average age increased by 4 years when 2 new students joined the group. What is the average age of the two new students who joined the group?
 - A. 15
 - B. 20
 - C. 22
 - D. 24
9. Change the following sentence to indirect tense: He said to him, "Why don't you go today?"
 - A. She asked him why he did not go that day
 - B. She said to him why he not gone
 - C. She asked him not to go that day
 - D. She asked him why he did not go today
10. Identify the tense used in the following sentence: They are working on the project together
 - A. Simple present
 - B. Present continuous
 - C. Simple past
 - D. Past continuous

11. She ____ her husband for 15 minutes.

- A. is beating
- B. has been beating
- C. has been beaten
- D. beats

12. Pick out the most appropriate word from the words given below each sentence to complete it meaningfully.
In the past, Zimbardo _____ many aspects of social psychology

- A. researches
- B. research
- C. researcher
- D. researched

13. If the volume of a cube is 1728 cm^3 , the length of its edge is equal to:

- A. 7 cm
- B. 12 cm
- C. 18 cm
- D. 19 cm

14. The perimeter of a circular and square fields are equal. If the area of the square field is 484 m^2 , then the diameter of the circular field is

- A. 7 m
- B. 14 m
- C. 21 m
- D. 28 m

15. The angle of elevation of top of a tower from a point on the ground, which is 30 m away from the foot of the tower is 30° . The length of the tower is

- A. $\sqrt{3} \text{ m}$

- B. $2\sqrt{3} \text{ m}$
- C. $5\sqrt{3} \text{ m}$
- D. $10\sqrt{3} \text{ m}$

16. In a rectangle, length=8 cm, breadth=6 cm. Then its diagonal = _____

- A. 9 cm
- B. 14 cm
- C. 10 cm
- D. 12 cm

17. Which of the given is a component of bio-gas?

- A. Methane
- B. LPG
- C. CNG
- D. Hydrogen sulphide

18. Which of the given is not attracted by a magnet?

- A. Steel
- B. Cobalt
- C. Brass
- D. Nickel

19. The light sensitive cell present on retina and is sensitive to the intensity of light is:

- A. Cones
- B. Rod cell
- C. Both cone and rod cell
- D. none

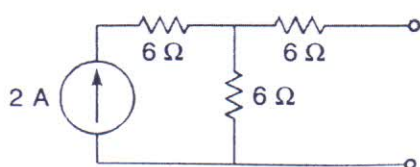
20. When light enters from a rarer medium to a denser medium:

- A. Its frequency changes
- B. Its wavelength changes

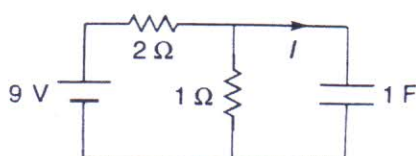
- C. Both wavelength and frequency change
- D. Both wavelength and frequency remain same

Part B (80 Marks)

21. Thevenin voltage and Norton current of the circuit is



- A. 10V, 2A
 - B. 11V, 1A
 - C. 10V, 1.5A
 - D. 12V, 1A
22. The maximum power that a 16V dc source having an internal resistance 4Ω can supply to resistive load is
- A. 20W
 - B. 15W
 - C. 16W
 - D. 10W
23. For steady state condition, the current I is given by



- A. 1A
 - B. 1.5A
 - C. 4.5A
 - D. 0A
24. A copper wire is stretched so that its length is increased by 0.1%. The change in resistance is
- A. 0.2%
 - B. 0.1%
 - C. 0.3%
 - D. 0.4%

25. Two similar cells whether joined in series or parallel have the same current through an external resistance of 2Ω . The internal resistance of each cell is

- A. 1Ω
- B. 0.5Ω
- C. 2Ω
- D. 1.5Ω

26. A 200W and 100W bulb both meant for operation at 220V are connected in series. When connected to a 220V supply, the power consumed by them is

- A. 33W
- B. 66W
- C. 100W
- D. 300W

27. Five equal capacitors connected in series have a resultant capacitance of $4\mu\text{F}$. When these capacitors are connected in parallel and charged to 400V dc, the total energy stored is

- A. 16 J
- B. 8 J
- C. 24 J
- D. 9 J

28. A 2cm coil has 10 turns and carries a current of 750 mA. The magnetising force of the coil is

- A. 225 AT/m
- B. 675 AT/m
- C. 450 AT/m
- D. 375 AT/m

29. A magnetic circuit carries a flux Φ_i in the iron part and a flux Φ_g in the air gap. Then leakage coefficient is

- A. Φ_i/Φ_g
 B. Φ_g/Φ_i
 C. $\Phi_i*\Phi_g$
 D. None of the above
30. The BH curve for _____ will be a straight line passing through origin
- A. air
 B. soft iron
 C. hardened steel
 D. silicon steel
31. A flux $\Phi=1$ mWb passes a strip having an area of 200 cm^2 and placed at an angle of 60° to the direction of uniform magnetic field. The value of magnetic flux density is
- A. 0.5 T
 B. 1.2 T
 C. 0.02 T
 D. 0.058 T
32. The mutual inductance between two unity coupled coils of 9H and 4H is
- A. 36H
 B. 13H
 C. 2.2H
 D. 6H
33. An alternating voltage is given by $v=30\sin 314t$. The time taken by the voltage to reach -30V for the first time is
- A. 0.02 Sec
 B. 0.1 Sec
 C. 0.03 Sec
 D. 0.015 Sec
34. An ac generator having 10 poles and running at 600 rpm will generate an alternating voltage of frequency
- A. 25 Hz
 B. 100 Hz
 C. 50 Hz
 D. 200 Hz
35. An alternating voltage is given by $v=100\sin 314t$ volts. Its average value will be
- A. 70.7 V
 B. 50 V
 C. 63.7 V
 D. 100 V
36. The active and reactive powers of an inductive circuit are 60W and 80VAR respectively. The power factor of the circuit is
- A. 0.8 lag
 B. 0.75 lag
 C. 0.6 lag
 D. 0.5 lag
37. Three identical resistances connected in star consume 4000W. If the resistances are connected in delta across the same supply, the power consumed will be
- A. 4000W
 B. 6000W
 C. 8000W
 D. 12000W
38. The errors introduced by an instrument fall in which category?
- A. Systematic errors
 B. Random errors
 C. Gross errors
 D. Environmental errors

39. Torque/weight ratio of an instrument indicates
- A. selectivity
 - B. accuracy
 - C. fidelity
 - D. sensitivity
40. The smallest change in measured variable to which an instrument will respond is
- A. accuracy
 - B. resolution
 - C. precision
 - D. sensitivity
41. Preferred material for permanent magnet is
- A. Stainless steel
 - B. alnico
 - C. tungsten steel
 - D. soft iron
42. The effect of stray magnetic fields on the actuating torque of a portable instrument is maximum when the operating field of the instrument and stray fields are
- A. perpendicular
 - B. parallel
 - C. inclined at 60°
 - D. inclined at 30°
43. Which of the following instruments is commonly used to measure primary current of a transformer connected to mains?
- A. Electrostatic meter
 - B. Current transformer
 - C. Moving coil type meter
 - D. Moving iron type meter
44. What is clamp-on ammeter used for
- A. Low ac current
 - B. High ac current
 - C. Low dc current
 - D. High dc current
45. The pressure coil of dynamometer type watt meter is
- A. Highly inductive
 - B. Highly resistive
 - C. Purely resistive
 - D. Purely inductive
46. The power of a three-wire balanced system was measured by two wattmeter method. The reading of one of the wattmeters was found to be double that of the other. What is the power factor of the system?
- A. 1.0
 - B. 0.866
 - C. 0.707
 - D. 0.5
47. Which one of the following bridges will be used for the measurement of very low resistance?
- A. Kelvin bridge
 - B. Maxwells bridge
 - C. Wheatstone bridge
 - D. Heys bridge
48. Inductance is measured by which one of the following?
- A. Wein bridge
 - B. Schering bridge
 - C. Maxwell bridge
 - D. Owen bridge

49. Q meter works on the principle of
- Mutual inductance
 - Self-inductance
 - Series resonance
 - Parallel resonance
50. A 1000 Hz sinusoidal voltage is connected to both X and Y inputs of a CRO. Which of the following waveforms is seen on CRO?
- Sine wave
 - circle
 - ellipse
 - straight line
51. when a short circuit test is conducted on a single-phase transformer, 30% of the rated voltage is required to allow full load current. The short circuit power factor is found to be 0.2. The percentage regulation at UPF is
- 30
 - 29.5
 - 15
 - 6
52. The efficiency of a 100 kVA transformer is 0.98 at full load as well as half load. For this transformer at full load, the ohmic loss
- is less than the core loss
 - is equal to core loss
 - is more than core loss
 - none of the above
53. A single-phase transformer has a rating of 15 kVA, 600V/120V. It is reconnected as an auto transformer to supply 720 V from 600V primary source. The maximum load it can supply is
- 90 kVA
 - 180 kVA
 - 15 kVA
 - 18 kVA
54. A 5 kVA, 250/125 V, 1-phase transformer has leakage impedance of $(0.02+j0.8)$ p.u.. Its value in ohm referred to hv side is
- $0.2+j0.8$
 - $0.25+j1$
 - $0.02+j0.08$
 - $0.0625+j0.25$
55. In all rotating electrical machines, electrical torque is developed when relative speed between stator field and rotor field is
- zero
 - equal to rotor speed
 - equal and opposite to rotor field
 - dependant upon type of electrical machine
56. A dc series motor driving an electric train faces a constant power load. It is running at rated speed and rated voltage. If the speed has to be brought down to 0.25, the supply voltage has to be approximately brought down to
- 0.75 p.u.
 - 0.5 p.u.
 - 0.25 p.u.
 - 0.125 p.u.
57. A dc shunt motor is running at 1200 rpm when excited with 220 V dc. Neglecting the losses and saturation, the speed of the motor

- when connected to a 175 V dc supply is
- A. 750 rpm
 - B. 900 rpm
 - C. 1050 rpm
 - D. 1200 rpm
58. If the applied voltage to a dc machine is 230 V, then the back emf for maximum power developed is
- A. 115 V
 - B. 200 V
 - C. 230 V
 - D. 460V
59. The commutator segments of dc machines are made up of
- A. brass
 - B. copper
 - C. hard drawn copper
 - D. copper alloy
60. poly phase synchronous motor is preferred over poly phase induction motor for a load requiring
- A. 600 kW at 3000 rpm
 - B. 600 kW at 1500 rpm
 - C. 600 kW at 1000 rpm
 - D. 600 kW at 500 rpm
61. A 3-phase 400V, 50 Hz synchronous motor is operating with a load angle of 25° . If the load on the motor is doubled, keeping other parameters constant, the new load angle will be
- A. 50°
 - B. 51.5°
 - C. 53.4°
 - D. 57.7°
62. Which one of the following methods will give a higher than actual value of regulation of an alternator?
- A. ZPF method
 - B. MMF method
 - C. EMF method
 - D. ASA method
63. A 3-phase induction motor draws active power P and reactive power Q from the grid. If it is operated as a generator, P and Q will respectively be
- A. Positive and negative
 - B. Negative and negative
 - C. Positive and positive
 - D. Negative and positive
64. A star delta starter is equivalent to an auto transformer starter with a tapping of
- A. 86.6%
 - B. 57.73%
 - C. 57%
 - D. 58%
65. Motor A has deeper and narrow slots, whereas motor B has shallow and wider slots. Induction motor A, as compared to motor B, has
- A. Less pull-out torque
 - B. Less operating speed
 - C. Less starting torque
 - D. Better operating pf
66. An electric train employing a dc series motor is running at a fixed speed, when a sudden slight drop in the mains voltage occurs. This would result in

- A. Drop in speed and rise in current
 - B. Rise in speed and drop in current
 - C. Rise in speed and rise in current
 - D. Drop in speed with current unaltered
67. For quick speed reversal, the motor preferred is
- A. dc motor
 - B. squirrel cage induction motor
 - C. slip-ring induction motor
 - D. synchronous motor
68. In rotating electrical machines, the insulation temperature limit for class B type is
- A. 105°C
 - B. 130°C
 - C. 150°C
 - D. 180°C
69. In an electric arc welding, the voltage required to strike an arc is about
- A. 50-60 V
 - B. 80-90 V
 - C. 100-120 V
 - D. 230 V
70. For the same wattage the lamp that will produce minimum radiant heat is
- A. Sodium vapour lamp
 - B. Fluorescent lamp
 - C. Tungsten filament lamp
 - D. Mercury vapour lamp
71. A 1000 W bulb fitted with a reflector illuminates an area of 3 m x 3 m with an average illumination of 450 lux. If the bulb has an efficiency of 9 lumens / watt the efficiency of the reflector is _____%
- A. 70
 - B. 45
 - C. 30
 - D. 20
72. The unit of solid angle is
- A. lumen
 - B. radian
 - C. steradian
 - D. candela
73. Which wiring circuit needs to switch ON a lamp ahead, while the light behind is put OFF
- A. stair case wiring
 - B. tunnel wiring
 - C. godown wiring
 - D. corridor wiring
74. How many outlet points are recommended in a power sub-circuit as per BIS?
- A. 1
 - B. 2
 - C. 8
 - D. 10
75. Which method is used to reduce earth resistance value in an existing earth?
- A. Increasing the length of electrode
 - B. Keeping wet condition in earth pits always
 - C. Adding more sand and charcoal in earth pits

- D. Increasing the diameter of earth electrode
76. Compared to a single-phase half-bridge inverter, the output power of a single phase full-bridge inverter is higher by a factor of
- A. 12
B. 8
C. 4
D. 2
77. In a 3-phase semi-converter, if the firing angle is less than or equal to 60° , then the duration of conduction of each thyristor and diode would be respectively
- A. 60° and 60°
B. 90° and 30°
C. 120° and 120°
D. 180° and 180°
78. A single-phase voltage source square-wave inverter feeds pure inductive load. The waveform of the load current will be
- A. sinusoidal
B. rectangular
C. trapezoidal
D. triangular
79. In dc choppers, per unit ripple is maximum when the duty cycle is
- A. 0.2
B. 0.5
C. 0.7
D. 0.9
80. The input voltage of Zener voltage regulator varies from 20 V to 30 V. The load current varies from 10mA to 15mA. If the Zener voltage is 5 V, the value of series resistor will be
- A. 1 k Ω
B. 1.5 k Ω
C. 1.66 k Ω
D. 2.5 k Ω
81. The emitter resistance in a differential amplifier is used to
- A. Provide a high output impedance
B. Provide a high gain
C. Bias the transistor in active region
D. Provide a constant current source
82. In the case of subtraction of two bits, the difference-bit can be implemented by
- A. 2-input EX-OR gate
B. 2-input NAND gate
C. 2-input EX-NOR gate
D. 2-input NOR gate
83. An 8-input multiplexer is to be built with a tree network of 2-input multiplexers. The number of 2-input multiplexers required is
- A. 4
B. 8
C. 6
D. 7
84. Ripple factor for a half-wave and full-wave rectifier circuit respectively are
- A. 0.48 and 1.21
B. 0.48 and 0.121
C. 4.8 and 1.21
D. 1.21 and 0.48

85. The master-slave JK flip-flop is an example of
- A. Level-triggered device
 - B. Pulse triggered device
 - C. Positive edge triggered device
 - D. Negative edge triggered device
86. Which of the following plants is suitable for peak load?
- A. Diesel engine plant
 - B. Steam power plant
 - C. Nuclear power plant
 - D. Hydroelectric power plant
87. For high head and low discharge, the water turbine used is
- A. Pelton wheel
 - B. Kaplan turbine
 - C. Francis turbine
 - D. Propeller turbine
88. The chances of occurrence of corona are maximum during
- A. Dry weather
 - B. Hot summer
 - C. Winter
 - D. Humid weather
89. Charging current in transmission line
- A. Reduces the line losses
 - B. Increases the line losses
 - C. Will not affect the line losses
 - D. Unpredictable
90. The critical value of surge impedance of a long transmission line is
- A. $1000\ \Omega$
 - B. $400\ \Omega$
 - C. $250\ \Omega$
 - D. $50\ \Omega$
91. The insulation resistance of a cable of length 10 km is $1\ \text{M}\Omega$. Its resistance for 50 km length will be
- A. $1\ \text{M}\Omega$
 - B. $5\ \text{M}\Omega$
 - C. $0.2\ \text{M}\Omega$
 - D. None of these
92. The transient voltage that appears across the contacts at the instant of arc extinction is known as
- A. Flash-over voltage
 - B. Restriking voltage
 - C. Recovery voltage
 - D. Breaking voltage
93. Which of the following circuit breakers has high reliability and negligible maintenance?
- A. Air blast
 - B. SF₆
 - C. Oil
 - D. Vacuum
94. Directional over current relay is used for protection of
- A. Long transmission line
 - B. Large power transformer
 - C. Ring main distribution line
 - D. Radial distribution line
95. Thermal relays are used for protection of motors against over current owing to
- A. Short circuits
 - B. Heavy loads
 - C. Earth fault

- D. All of these
96. Reactance relays are employed for phase fault in
- A. Short lines
 - B. Medium lines
 - C. Long lines
 - D. Any of these
97. Steepness of the travelling waves is attenuated by
- A. Line resistance
 - B. Line inductance
 - C. Line capacitance
 - D. Both (b) and (c)
98. The magnetising inrush current in a transformer is rich in
- A. 2nd harmonic
 - B. 3rd harmonic
 - C. 5th harmonic
 - D. 7th harmonic
99. If a synchronous machine is under excited, it takes lagging VARs from the system when it is operated as
- A. Synchronous generator
 - B. Synchronous motor
 - C. Synchronous generator as well as motor
 - D. None of these
100. The operation of the relay which is most affected due to arc resistance is
- A. Mho relay
 - B. Reactance relay
 - C. Impedance relay
 - D. All are equally affected