NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

Recruitment for the post of Junior Engineer (Electrical)

[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. The United Nations Organization has its Headquarters at

   A. Bali
   B. Hague
   C. New York
   D. Washington DC

2. Tsunamis are not caused by

   A. Hurricanes
   B. Earthquakes
   C. Undersea landslides
   D. Volcanic eruptions

3. The largest fresh water lake in India is?

   A. Pulicat Lake
   B. Veeranam Lake
   C. Chilka Lake
   D. Kolleru Lake

4. The chief ore of Aluminium is?

   A. Iron
   B. Bauxite
   C. Cryolite
   D. haematite

5. The world's largest desert is

   A. Thar
   B. Kalahari
   C. Sahara
   D. Sonoran

6. A and B are brothers. C and D are sisters. A's son is D's brother. How is B related to C

   A. Father
   B. Brother
   C. Uncle
   D. Grand father

7. Tutu pays 60% of his salary as house rent, 15% of salary as loan instalment and he still saves Rs. 900 after spending Rs. 1,800 on other household goods. What is his salary in Rs?

   A. 2700
   B. 8100
   C. 10800
   D. 13500

8. There are twenty-four students in a certain class. For every nine girls there are three boys. How many girls and how many boys are there in the class?

   A. 19 and 5
   B. 18 and 6
   C. 15 and 9
   D. 14 and 10

9. Change the following sentence to indirect tense: I said to him, "Why are you working so hard?"

   A. I asked him why he was working so hard
   B. I asked him why was he working so hard
   C. I asked him why had he been working so hard
   D. I asked him why he had been working so hard

10. Identify the tense used in the following sentence: She speaks well

    A. Present perfect
    B. Simple present
    C. Present continuous
    D. Simple future

11. Please don't laugh _____ those beggars.

A. for
B. against
C. at
D. from

12. I never miss a football match. I _____ fond of it since my childhood.

A. am
B. have been
C. has been
D. will be

13. The radius of spherical balloon increases from 8 cm to 12 cm. The ratio of the surface areas of balloon in two cases is:

A. 2:3
B. 3:6
C. 4:9
D. 8:27

14. The perimeter of the sector with radius 10.5 cm and sector angle 60^{o} is

A. 11 cm
B. 23 cm
C. 32 cm
D. 41 cm

15. When the length of shadow of a vertical pole is equal to $\sqrt{3}$ times of its height, the angle of elevation of the Sun's altitude is

A. 15^{o}
B. 30^{o}
C. 45^{o}
D. 60^{o}

16. If a triangle and a parallelogram are on the same base and between same parallels, then what is the ratio of the area of triangle to the area of parallelogram?

A. 1:2
B. 3:2
C. 1:3
D. 4:1

17. Quality of fuel is measured by

A. Calorific value
B. Combustion value
C. Initial value
D. None of these

18. A magnetic field line is used to find the direction of:

A. South-north
B. A compass needle
C. A bar magnet
D. Magnetic field

19. The phenomenon of light responsible for the working of human eye is:

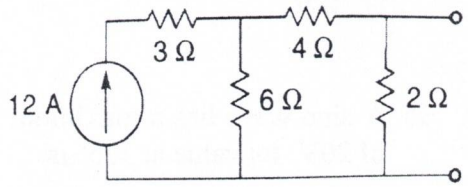
A. Reflection
B. Refraction
C. Power of accommodation
D. Persistence of vision

20. Refractive index:

A. Depends on the wavelength of light used to measure
B. Is actual property of the substance
C. Depends on the angle of incidence
D. None of these

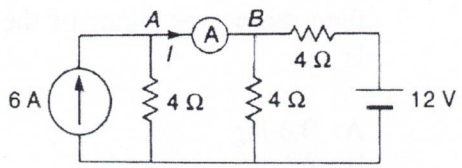
Part B (80 Marks)

21. Find the Thevenin voltage and R_{Th} of the circuit



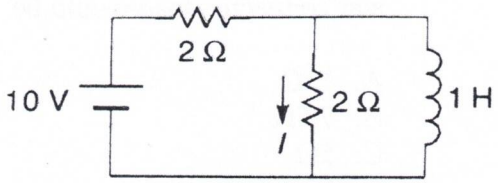
A. 12 V, 2Ω
B. 10 V, 3Ω
C. 11 V, 3Ω
D. 12 V, 3Ω

22. The current through the ammeter is given by



A. 2A
B. 3A
C. 4A
D. 1A

23. For steady state condition, the current I is given by



A. 1A
B. 2A
C. 0A
D. 1.5A

24. A piece of aluminium wire is stretched to reduce its diameter to half of its original value. Its resistance will become

A. Two times
B. Sixteen times
C. Eight times
D. Four times

25. Two identical cells connected in series send 10A through a 5Ω resistor. When they are connected in parallel, they send 8A through the same resistor. The internal resistance of each cell is

E. Zero
F. 10Ω
G. 1Ω
H. 2.5Ω

26. The open circuited voltage at the terminals of load R is 30V. Under the condition of maximum power transfer, the load voltage will be

A. 30V
B. 10V
C. 15V
D. 5V

27. A parallel plate capacitor has plate separation t and a capacitance of 100 pF. If a metallic foil of thickness t/3 is introduced between the plates, the capacitance would become

A. 100 pF
B. 180 pF
C. 200/3 pF
D. 150 pF

28. A magnetising force of 800 AT/m will produce a flux density of ____ in air

A. 1 mWb/m^2
B. 1 Wb/m^2
C. 10 mWb/m^2
D. 0.5 Wb/m^2

29. The magnetic material used for ___ should have a large hysteresis loop.

A. Transformer
B. d.c. generators
C. a.c motors
D. permanent magnets

30. For high frequencies, the material used for transformer core is

A. silicon iron
B. soft iron
C. ferrite
D. wood

31. An 8H chock is carrying a current of 500 mA. The energy stored in the magnetic field is

A. 1 J
B. 0.5 J
C. 2 J
D. 4 J

32. A coil having 500 square loops each of side 10 cm is placed normal to a magnetic flux which increases at a rate of 1T/sec. The induced emf is

A. 1 V
B. 0.5 V
C. 0.1 V
D. 5 V

33. An alternating voltage is given by v=200sin314t. Its rms value will be

A. 100 V
B. 282.8 V
C. 141.4 V
D. 121.4 V

34. When a 15V square wave is connected across a 50V ac voltmeter, it will read

A. 15 V
B. $15\sqrt{2}$ V
C. $15/\sqrt{2}$ V
D. 0 V

35. A sine wave has a maximum value of 20V. Its value at 135^{o} is

A. 10 V
B. 14.14 V
C. 15 V
D. 5 V

36. An inductive circuit draws a line current of 10 A. If the reactive component of line current is 6 A, then the power factor of the circuit is

A. 0.6 lag
B. 0.8 lag
C. 0.5 lag
D. 0.2 lag

37. Three identical resistances each of 15Ω are connected in delta across 400V, 3 phase supply. The value of resistance in each leg of equivalent star connected load would be

A. 15Ω
B. 7.5Ω
C. 5Ω
D. 30Ω

38. Loading effect is primarily caused by instrument having

A. High resistance
B. High sensitivity
C. Low sensitivity
D. High range

39. The degree of refinement with which the measured value is stated is defined as

A. precision
B. correction
C. repeatability
D. stability

40. The difference between the indicated value and the true value of a quantity is

A. Gross error
B. Absolute error
C. Dynamic error
D. Relative error

41. Hysteresis error in moving iron instruments may be reduced by using

A. mumetal
B. stainless steel
C. silver coating
D. High speed steel

42. The term artificial aging in instrument is associated with

A. springs
B. permanent magnets
C. controlling torque
D. damping

43. Moving iron and PMMC instruments can be distinguished from each other by looking at

A. pointer
B. terminal size
C. scale
D. scale range

44. Which of the following meters does not exhibit square law response?

A. Moving coil
B. Moving iron
C. electrodynamometer
D. hot wire instrument

45. The primary current in a CT is dictated by

A. The secondary burden
B. The core of the transformer
C. The load current
D. None of the above

46. Which of the following is measured by loss of charge method?

A. Low R
B. High R
C. Low L
D. High L

47. In an Anderson bridge, the unknown inductance is measured in terms of known

A. resistance
B. capacitance
C. inductance and resistance
D. resistance and capacitance

48. The dielectric loss of a capacitor can be measured by which one of the following?

A. Wein bridge
B. Owen bridge
C. Schering bridge
D. Maxwell bridge

49. Beam of electrons in a cathode ray tube emanates because of

A. Secondary emission
B. Thermionic emission
C. diffusion
D. post acceleration

50. A digital voltmeter has $4\frac{1}{2}$ digit display. The 1V range can be read up to

A. 1.0000
B. 1.1111
C. 0.9999
D. 1.9999

51. Transformer action requires a

A. Constant magnetic flux
B. increasing magnetic flux
C. alternating magnetic flux
D. alternating electric flux

52. If a transformer primary is energised by from a square wave voltage source, then its output voltage will be

A. zero
B. sine wave
C. triangular
D. pulse

53. A 3:1 transformer has impedance of (1+j5)Ω on the lv side and (9+j45)Ω on the hv side. The total equivalent impedance at the hv terminals is

A. 18+j90 Ω
B. 2+j10 Ω
C. 10+j50 Ω
D. 8+j40 Ω

54. An auto transformer having a transformation ratio of 0.8 supplies a load of 10kW. The power transferred inductively from the primary to secondary is

A. 10 kW
B. 8 kW
C. 2 kW
D. zero

55. A synchronous machine has full pitch coils having coil span of 12 slots. For eliminating the third harmonic, the coil span should be

A. 6 slots
B. 8 slots
C. 9 slots
D. 10 slots

56. If the applied voltage to a dc machine is 120 V, then the back emf for maximum power developed is

A. 60 V
B. 80 V
C. 120 V
D. 240V

57. A dc cumulatively compounded motor delivers rated load torque at rated speed. If the series field is short circuited, then the armature current and speed will

A. Both increase
B. Both decrease
C. Increase and decrease respectively
D. Decrease and increase respectively

58. The type of dc generator used for arc welding purpose is

A. Series generator
B. Shunt generator

C. Cumulatively compound generator
D. Differentially compound generator

59. A 4-pole dc generator runs at 1500 rpm. The frequency of current in the armature winding is

A. 25 Hz
B. 50 Hz
C. 100 Hz
D. 200 Hz

60. When a 3-phase synchronous motor is running at synchronous speed, the damper winding produces

A. Damping torque
B. Eddy current torque
C. Torque aiding developed torque
D. No torque

61. A 3-phase synchronous generator connected to infinite bus is over excited. Considering only the reactive power, from the point of view of system, the machine acts as

A. A capacitor
B. An inductor
C. A resistor
D. As RL load

62. In a synchronous generator operating at zero power factor lagging, the effect of armature reaction is

A. Magnetising
B. Demagnetising
C. Cross magnetising
D. Both magnetising and cross magnetising

63. The most common application of 3-phase induction generator can be in

A. Steam power station
B. Hydro power station
C. Wind power station
D. Nuclear power station

64. Induction generator delivers power at

A. Unity pf
B. Zero pf lagging
C. Leading pf
D. Lagging pf

65. As compared to DOL starting, a cage IM with star delta starting shall have

A. More starting torque
B. More starting current
C. Reduced starting current
D. Smooth acceleration

66. An elevator drive is required to operate in

A. One quadrant only
B. Two quadrants
C. Three quadrants
D. Four quadrants

67. For continuously running rolling mills with intermittent loading, the most suitable dc drive is

A. dc series motor
B. dc shunt motor
C. dc differentially compounded motor
D. dc cumulatively compounded motor

68. For the speed control of ac drive, the preferred method using thyristors is

A. Phase control
B. Integral cycle control
C. Chopper control
D. All are equally good

69. In arc welding best results are obtained when arc length is equal to

A. 25 mm
B. 19 mm
C. Diameter of electrode
D. Double the diameter of electrode

70. The lamp that cannot sustain much voltage fluctuations is

A. Sodium vapour lamp
B. Mercury vapour lamp
C. Incandescent lamp
D. Mercury iodide lamp

71. What will be the number of lamps, each having 300 lumens, required to obtain an average illuminance of 50 lux on a 4m × 3m rectangular room?

A. 2
B. 4
C. 5
D. 6

72. Which of the following will need the highest level of illumination?

A. Proof reading
B. Bed rooms
C. Hospital ward
D. Railway platform

73. How many two-way switches are required in godown wiring circuit to control four lamps?

A. 2
B. 3
C. 4
D. 5

74. Which type of circuit breaker is used above 100 A current rating?

A. MCB
B. ELCB
C. RCCB
D. MCCB

75. Which colour wire is recommended for earth connection as per ISI code?

A. red
B. green
C. black
D. blue

76. For a step-up dc-dc chopper with an input dc voltage of 220 V, if the output voltage required is 330 V and the non-conducting time of thyristor is 100μs, the ON time of thyristor would be

A. 66.6μs
B. 100μs
C. 50μs
D. 200μs

77. The most suitable solid-state converter for controlling the speed of the three-phase cage motor at 25 Hz is

A. cycloconverter
B. current source inverter
C. voltage source inverter
D. load commutated inverter

78. The snubber circuit is used in the thyristor circuits for

A. triggering
B. dv/dt protection
C. di/dt protection
D. phase shifting

79. Equalising circuits are provided across each SCR in series operation to provide uniform

A. Current distribution
B. Voltage distribution
C. Firing of SCRs
D. None of these

80. The use of rectifier filter in a capacitor circuit gives satisfactory performance only when the load

A. Current is high
B. Current is low
C. Voltage is high
D. Voltage is low

81. Which of the following power plants is most reliable?

A. diesel
B. steam
C. tidal
D. hydro electric

82. A generating station which has high investment cost and low operating cost is usually operated as

A. Base load station
B. Peak load station
C. Medium load station
D. none of the above

83. The graphical representation of the discharge and time is known as

A. Load duration curve
B. Monograph
C. Hydrograph
D. Hectograph

84. Heavy water is used in nuclear power plant as

A. Fuel
B. Reflector
C. Moderator
D. Shield

85. The conductor connecting consumers terminals to the distributer is called as

A. feeder
B. service mains
C. distributer
D. connector

86. which of the following distribution systems is the most economical?

A. DC system
B. 1-phase ac system
C. 3-phase 3-wire ac system
D. 3-phase 4-wire ac system

87. Minimum horizontal clearance of low voltage line from residential buildings must be

A. 0.6 m
B. 1.2 m
C. 0.9 m
D. 1.6 m

88. A 66kV system has string insulator having 5 discs and the earth to capacitance ratio of 0.10. the string efficiency will be

A. 89%
B. 75%
C. 67%
D. 55%

89. The material commonly used for sheaths of underground cable is

A. Copper
B. Lead
C. Steel
D. Rubber

90. The surge impedance of cables is around

A. 20 Ω
B. 50 Ω
C. 100 Ω
D. 250 Ω

91. The recovery voltage will be maximum for power factor of

A. zero
B. 0.5
C. 0.707
D. Unity

92. Which of the following is Inexhaustible Natural Resources?

A. Air
B. Minerals
C. Forests
D. Coal

93. _____ is made up of smoke and fog.

A. Cloud
B. Smog
C. Frost
D. Haze

94. The effect of greenhouse gases on the average temperature of the earth's atmosphere?

A. Increases
B. Decreases
C. Remains same
D. First increase and then decreases

95. The shape or warning sign is
A. Circular

B. square
C. triangular
D. rectangular

96. As per the colour code a red colour indicates

A. Fire prevention
B. Radiant hazards
C. First aid equipment
D. General caution

97. Which type of network would phone lines use?

A. LAN
B. WAN
C. WWAN
D. MAN

98. Which of the following operation is mainly performed by RAM?

A. Read only
B. Write only
C. Read and write
D. Depends on the system

99. Low level language is also called _____.

A. Assembly language

B. Machine language
C. Middle ware
D. Source code

100. Which mechanism is used by the computer virus 'worm' to duplicate itself?

A. Swap
B. Increment
C. Spawn
D. Swarm