

# NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

## Recruitment for the post of Technical Assistant (Civil Engg)

[ Ref – Recruitment Notice No./NITRR/R-1/Adv./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 12 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.

1. Equation of  $(x+1)^2 - x^2 = 0$  has number of real roots equal to:
  - a) 1
  - b) 2
  - c) 3
  - d) 4
2. Rearrange the parts of the sentence in correct order.  
Climate change is
  - P. climate caused by natural forces in combination
  - Q. a broad topic that includes periodic alterations in Earth's
  - R. with the effects of various human activities like burning of
  - S. fossil fuels and changes in land cover and biodiversity
  - a) RSQP
  - b) PSQR
  - c) SRPQ
  - d) QPRS
3. Which of the following options gives the process of extraction of mercury from its ore cinnabar?
  - a) Cooling cinnabar in the presence of excess air
  - b) Cooling cinnabar to convert it into mercuric oxide and then heating it
  - c) Cinnabar to convert it into mercuric oxide and then heating it again
  - d) Cinnabar in the presence of limited air, and then adding a small amount of water
4. Which countries sent cheetahs to India as part of 'Project Cheetah'?
  - a) Egypt and Botswana
  - b) Namibia and South Africa
  - c) Botswana and South Africa
  - d) Namibia and Botswana
5. The quadratic equation  $x^2 + 7x - 60$  has
  - a) two equal roots
  - b) two real and unequal roots
  - c) no real roots
  - d) two equal complex roots
6. In a certain code language, 'BEHOLD' is written as 'BDEHLO' and 'INDEED' is written as 'DDEEIN'. How will 'COARSE' be written in that language?
  - a) ACORSE
  - b) ACROSE
  - c) ACEORS
  - d) ACEOSR
7. Choose the word that can substitute the given group of words.  
Study of heavenly bodies
  - a) Numerology
  - b) Astronomy
  - c) Astrology
  - d) Stargazing
8. A circuit has a charge of 2C moving through it in 3 s. Which electrical component in the circuit, if present, will show the current?
  - a) Voltmeter will show a current of 6 A
  - b) Ammeter will show a current of 0.7 A
  - c) Rheostat will show a current of 0.7 A
  - d) Resistor will show a current of 0.35 A
9. What was the theme of this year's G20 Summit?
  - a) 'Vasudhaiva Kutumbukam' or 'One Earth, One Family, One Future'
  - b) 'Lokah Samastah Sukhino Bhavantu' or 'Let The Entire World Be Happy'

- c) 'Ati Sarvanāśaheturhyato'tyantam Vivarjayet' or 'Excess is the cause of ruin'  
 d) 'Aniṣidhdamanumatam' or ' Silence gives consent'

10. 30th term of the A.P: 10, 7, 4, ..., is

- a) 97  
 b) 77  
 c) -77  
 d) -87

11. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.  
 GAVE : AGEV :: KEPT : EKTP :: LEFT : ?

- a) EFLT  
 b) ELFT  
 c) LETF  
 d) ELTF

12. Select the most appropriate 'one word' for the expression given below.  
 A professional rider in horse race.

- a) Jockey  
 b) Horse Pilot  
 c) Autocrat  
 d) Cellar

13. The decomposers in an ecosystem:

- a) Convert organic material to inorganic forms  
 b) Convert inorganic material to simpler forms  
 c) Convert inorganic material into the organic compound  
 d) Do not break down the organic compound

14. In January 2022, who among the following has won his first Allan Border medal ?

- a) Steven Smith  
 b) Virat Kohli  
 c) Mitchell Starc  
 d) Usman Khawaja

15. The value of  $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$  is:

- a) 0  
 b) 1  
 c) 2  
 d) 4

16. Select the option that is related to the third number in the same way as the second number is related to the first number and the sixth number is related to the fifth number.

12 : 16 :: 18 : ? :: 24 : 64

- a) 26  
 b) 32  
 c) 28  
 d) 36

17. Choose the sentence with no spelling error.

- a) I do not requir any technical knowledge or expertice.  
 b) I do not require any technichal knowledge or expertise.  
 c) I do not require any technical knowledge or expertise.  
 d) I do not require any technical knowlege or expertice.

18. The basic goal of the computer process is to convert data into:

- a) Graphs
- b) Files
- c) Tables
- d) Information

19. Who is the upcoming president of G20 ?

- a) UK
- b) Israel
- c) USA
- d) Brazil

20. Which of the following numbers will replace the question mark (?) in the given series?

2, 4, 10, 28, ?, 244

- a) 94
- b) 90
- c) 88
- d) 82

21. A material having the same property in all directions is called:

- a) Homologous
- b) Isotropic
- c) Homogeneous
- d) Elastic

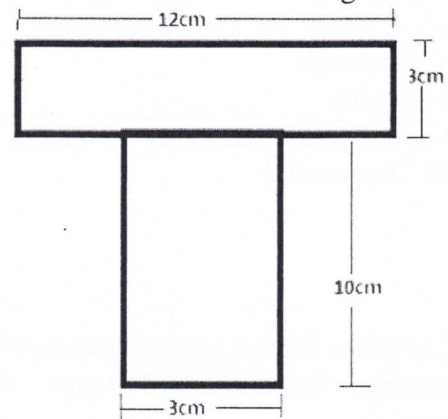
22. Hooke's law refer to stress and strain in the body holds true upto

- a) Elastic limit
- b) Yield point
- c) Plastic limit
- d) Breaking point

23. If a bar of two different length are in a line and P load is acting axially on them then what will be the change in length of the bar if the radius of both different lengths is same?

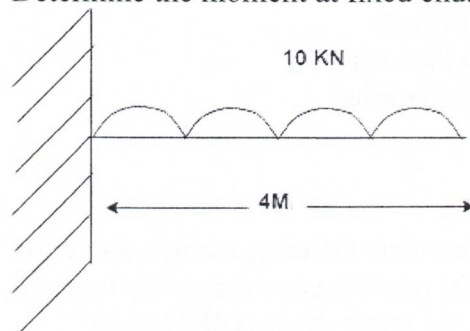
- a)  $PA/E \times (L_1 + L_2)$
- b)  $P/EA \times (L_1 + L_2)$
- c)  $E/PA \times (L_1 + L_2)$
- d)  $P/E \times (L_1 + L_2)$

24. Where will be the centre of gravity of the T section shown in the figure?



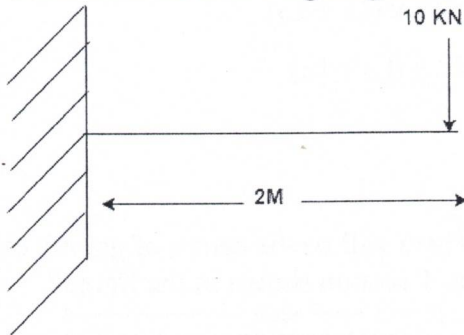
- a) At 8.545cm
- b) At 6.5cm
- c) At 5cm
- d) At 9.25cm

25. Determine the moment at fixed end.



- a) 40 kNm
- b) 80 kNm
- c) 50 kNm
- d) 60 kNm

26. Shear force of following diagram



- a) Rectangle
- b) Square
- c) Circle
- d) Trapezoidal

27. Calculate the modulus of section of rectangle beam of size 240 mm × 400 mm.

- a)  $5.4 \times 10^6 \text{ mm}^3$
- b)  $6.2 \times 10^6 \text{ mm}^3$
- c)  $5.5 \times 10^6 \text{ mm}^3$
- d)  $6.4 \times 10^6 \text{ mm}^3$

28. Gold, Copper and lead are the examples of \_\_\_\_\_

- a) Malleability
- b) Creep
- c) Plasticity
- d) Ductility

29. Calculate the torque which a shaft of 300 mm diameter can safely transmit, if the shear stress is 48 N / mm<sup>2</sup>.

- a) 356 kNm

- b) 254 kNm
- c) 332 kNm
- d) 564 kNm

30. The mathematical expression for resilience 'U' is \_\_\_\_\_

- a)  $U = \sigma^2/E \times \text{volume}$
- b)  $U = \sigma^2/3E \times \text{volume}$
- c)  $U = \sigma^2/2E \times \text{volume}$
- d)  $U = \sigma/2E \times \text{volume}$

31. Which one is metamorphic rock?

- a) Schist
- b) Limestone
- c) Granite
- d) Sandstone

32. Bulls trench kiln is used in the manufacturing of

- a) Bricks
- b) M-Sand
- c) Cement
- d) Lime

33. The apparatus used to test the fineness of cement is

- a) Vicat's apparatus
- b) Le Chatelier's apparatus
- c) Any of these
- d) Blain's air permeability apparatus

34. Which of the following components of ordinary Portland cement is responsible for flash setting?
- $C_3A$
  - $C_3S$
  - $C_2S$
  - $C_4AF$
35. The apparatus used to test the fineness of cement is
- Workability
  - Soundness
  - Fineness
  - Strength
36. Pier foundation is also called
- Caisson
  - Girder
  - Box
  - Bridge
37. Which type of glass is used in the manufacture of artificial gems, bulbs, lenses, etc?
- Potash-lead glass
  - Common glass
  - Soda-lime glass
  - Special glass
38. The vertical portion between each tread on the stair is called:
- Going
  - Nosing
  - Winder
  - Riser
39. Which of the below is not an artificial resin?
- Vinyl
  - Alkyl
  - Phenolic
  - Shellac
40. Which of the following cement is used in sewage and water treatment plants?
- Sulphate Resisting Cement
  - Quick Setting Cement
  - Low Heat Cement
  - Rapid Hardening Cement
41. Void ratio is the ratio of
- volume of voids to total volume
  - volume of voids to volume of solids
  - volume of solids to volume of voids
  - volume of soil mass to volume of voids
42. The water content of a soil sample cannot be determined by \_\_\_\_\_ method.
- oven drying
  - alcohol
  - calcium carbide

d) pipette

d) 120 kPa

43. Darcy's law is valid for only \_\_\_\_\_

- a) Laminar flow
- b) Turbulent flow
- c) Hydraulic flow
- d) All of the mentioned

47. The coarse-grained soil has a void ratio of 0.75, and specific gravity of 2.75. The critical gradient at which quicksand condition occurs is

- a) 0.25
- b) 0.50
- c) 0.75
- d) 1.00

44. An isobar is a curve connecting all points of \_\_\_\_\_ below the ground.

- a) equal vertical pressure
- b) equal horizontal pressure
- c) unequal horizontal pressure
- d) unequal vertical pressure

48. Clays with high plasticity are best compacted

- a) Static roller
- b) Sheep foot roller
- c) Vibratory roller
- d) Pneumatic roller

45. The permeability of soil in the field is determined by:

- a) Constant head permeability test
- b) Pumping out test
- c) Variable head permeability test
- d) Consolidation test

49. The slow decrease in volume of soils caused by the time lag to permit water to flow out of the loaded soil mass is called:

- a) Consolidation
- b) Permeability
- c) Seepage flow
- d) Decreased volume of soils

46. The river is 2m deep. The river bed consists of saturated sand with a unit weight of  $20 \text{ kN/m}^3$ . What is the effective stress at 4m below the top of the sand?

- a) 40 kPa
- b) 60 kPa
- c) 80 kPa

50. Unconfined compressive strength test is

- a) Undrained Test
- b) Drained Test
- c) Consolidated Test

- d) None of the above
51. When drawing the mohr's involve, if the angle of internal friction is assumed to be then the relation can be considered in straight line
- Right angle
  - Zero
  - Constant
  - Acute angle
52. Rebhann's graphical method is based on
- Rankine's theory
  - Westergaard's theory
  - Culamnn's theory
  - Coulomb's theory
53. If the smallest division of a vernier is longer than the smallest division of its primary scale, the vernier is known as
- Direct vernier
  - Double vernier
  - Retrograde vernier
  - Simple vernier
54. The line normal to the plumb line is known as
- Horizontal line
  - Level line
  - Datum line
  - Vertical line
55. The desired sensitivity of a bubble tube with 2 mm divisions is 30". The radius of the bubble tube should be
- 13.75 m
  - 3.44 m
  - 1375 m
  - None of these
56. Three point problem can be solved by
- Tracing paper method
  - Bessel's method
  - Lehman's method
  - all of the above
57. Hydrographic surveys deal with the mapping of
- Large water bodies
  - Canal system
  - Heavenly bodies
  - Mountainous region
58. The sensitiveness of a level tube decreases if
- Radius of curvature of its inner surface is increased
  - Diameter of the tube is increased
  - Length of the vapour bubble is increased
  - Both viscosity and surface tension are increased

59. The main principle of surveying is to work
- From part to the whole
  - From whole to the part
  - From higher level to the lower level
  - From lower level to higher level
60. Cross-staff is used for
- Setting out right angles
  - Measuring contour gradient
  - Taking levels
  - Measuring distances
61. The camber for hill roads in case of bituminous surfacing is adopted as
- 2 %
  - 2.5 %
  - 3 %
  - 4 %
62. Maximum number of vehicles can be parked with
- Parallel parking
  - 30° angle parking
  - 45° angle parking
  - 90° angle parking
63. In CBR test the value of CBR is calculated at
- 2.5 mm penetration only
  - 5.0 mm penetration only
  - 7.5 mm penetration only
  - Both 2.5 mm and 5.0 mm penetrations
64. Bottom most layer of pavement is known as
- Wearing course
  - Base course
  - Sub-base course
  - Sub-grade
65. If  $N$  is the algebraic difference of grades,  $S$  is the head light beam distance in metres, the length ( $L$ ) of a valley curve, is
- $NS^2/4$
  - $NS^2/6$
  - $NS^2/9.6$
  - $NS^2/4.8$
66. Traffic engineering only includes
- Planning of regulatory measures
  - Design and application of control devices
  - Analysis of traffic characteristics
  - All the above
67. The period of long term plan for the development of roads in India, known as Bombay Plan (Aug. 1958), is

- a) 5 years
- b) 10 years
- c) 15 years
- d) 20 years

- b) unity
- c) infinity
- d) more than that of a real fluid

68. At a road junction, 16 cross conflict points are severe, if
- a) Both are one-way roads
  - b) Both are two-way roads
  - c) One is two-way road and other is one-way road
  - d) None of these

69. Minimum permissible speed on high speed roads, is decided on the basis of
- a) 15 percentile cumulative frequency
  - b) 20 percentile cumulative frequency
  - c) 30 percentile cumulative frequency
  - d) 40 percentile cumulative frequency

70. The absolute minimum sight distance required for stopping a vehicle moving with a speed of 80 kmph, is
- a) 120 m
  - b) 200 m
  - c) 640 m
  - d) None of these

71. The value of the compressibility of an ideal fluid is
- a) zero

72. 15 bar equals to \_\_\_\_\_ Pascals.

- a)  $10^7$  Pa
- b)  $1.5 \times 10^6$  Pa
- c) 100 Pa
- d) 1000 Pa

73. Which of the following is the correct relation between centroid (G) and the centre of pressure (P) of a plane submerged in a liquid?

- a) G is always below P
- b) P is always below G
- c) G is either at P or below it
- d) P is either at G or below it

74. A manometric liquid should suitably have \_\_\_\_\_

- a) Low density & Low Vapour pressure
- b) Low density & High Vapour pressure
- c) High density & Low Vapour pressure
- d) High density & High Vapour pressure

75. What type of flow can be taken for granted in a pipe of a uniform cross-section?

- a) steady
- b) unsteady

- c) uniform  
d) non-uniform
76. The continuity equation is based on the principle of  
a) conservation of mass  
b) conservation of momentum  
c) conservation of energy  
d) conservation of force
77. The Bernoulli's equation in fluid dynamics is valid for \_\_\_\_\_  
a) Compressible flows  
b) Transient flows  
c) Continuous flows  
d) Viscous flows
78. The error in discharge ( $dQ/Q$ ) to the error in measurement of head ( $dH/H$ ) over a triangular notch is given by  
a)  $dQ/Q = 3/2 \times (dH/H)$   
b)  $dQ/Q = 2 \times (dH/H)$   
c)  $dQ/Q = 5/2 \times (dH/H)$   
d)  $dQ/Q = 3 \times (dH/H)$
79. The mass of  $2.5 \text{ m}^3$  of a certain liquid is 2 tonnes. Its mass density is  
a)  $200 \text{ kg/m}^3$   
b)  $400 \text{ kg/m}^3$   
c)  $600 \text{ kg/m}^3$   
d)  $800 \text{ kg/m}^3$
80. The flow in a pipe is neither laminar nor turbulent when Reynold number is  
a) Less than 2000  
b) Between 2000 and 2800  
c) More than 2800  
d) None of these
81. The maximum discharge over a broad crested weir is  
a)  $0.384 C_d \times L \times H^{1/2}$   
b)  $0.384 C_d \times L \times H^{3/2}$   
c)  $1.71 C_d \times L \times H^{1/2}$   
d)  $1.71 C_d \times L \times H^{3/2}$
82. The Cipoletti weir is a \_\_\_\_\_ weir.  
a) Triangular  
b) Trapezoidal  
c) Circular  
d) Rectangular
83. Flow of water in a pipe about 3 metres in diameter can be measured by  
a) Orifice plate  
b) Venturimeter  
c) Rotameter  
d) Pitot tube

84. Rotameter is a device used to measure
- Absolute pressure
  - Velocity of fluid
  - Flow
  - Rotation
85. A venturi-flume is used to measure
- Pressure of liquid
  - Discharge of liquid
  - Pressure difference between two points in a channel
  - Pressure difference between two points in a pipe
86. The main disadvantage of hard water, is
- Greater soap consumption
  - Scaling of boilers
  - Corrosion and incrustation of pipes
  - All the above
87. Mostly used coagulant, is
- Chlorine
  - Alum
  - Lime
  - Bleaching powder
88. A city supply includes
- Domestic water demand
  - Industrial and commercial water demands
  - Demand for public uses and fire
  - All the above
89. If  $G$  is the specific gravity of particles of diameter  $d$ , the velocity of settlement  $V$  in still water at  $T^{\circ}\text{C}$ , according to Stoke's law, is
- $V = 418 (G - 1) d^2 [(3T + 70)/100]$
  - $V = 418 (G - 1) d [(3T - 70)/100]$
  - $V = 418 (G - 1) d^2 [(2T + 70)/100]$
  - $V = 418 (G - 1) d^4 [(3T + 70)/100]$
90. Manholes are less common in
- Cast iron pipes
  - Steel pipes
  - R.C.C. pipes
  - Hume steel pipes
91. Sunlight\_\_\_\_\_
- Helps growth of bacterias
  - Impedes growth of algae
  - Increases dissolved oxygen content
  - Reduces turbidity
92. Disinfection of drinking water, is done to remove
- Odour
  - Bacterias
  - Turbidity

- d) Colour
93. The best and Engineering way of collection of refuse is by \_\_\_\_\_
- Manual scavengers in open cart
  - Road side bins
  - Municipal trucks directly from the houses
  - Individual house pits
94. Leachate is associated with
- Pyrolysis
  - Composting
  - Incineration
  - Recycling of dry waste
95. Which of the following is NOT a principal method of laying out water distribution system?
- Grid-iron system
  - Pumping system
  - Radial system
  - Dead-end system
96. Eutrophication of water bodies is caused by the
- discharge of toxic substances
  - excessive discharge of nutrients
  - excessive discharge of suspended solids
  - excessive discharge of chlorides
97. 5 day BOD is taken at a temperature of
- 20°C
  - 10°C
  - 15°C
  - 0°C
98. The layout of distribution system in which water flow towards the outer periphery is
- Ring system
  - Dead end system
  - Radial system
  - Grid iron system
99. Which of the following is the statement treatment of rapid sand filter plants?
- Pre chlorination
  - Post chlorination
  - Super chlorination
  - Plain chlorination
100. The aeration of water is done for the removal of \_\_\_\_\_
- Turbidity
  - Colour
  - Hardness
  - Dissolved gases