Set Code : T2

Booklet Code : A

Note: *(1) Answer **all** questions.*

*(2) Each question carries **1** mark. There are no negative marks.*

(3) Answer to the questions must be entered only on OMR Response Sheet provided separately by completely shading with H.B. Pencil, only one of the circles 1, 2, 3 or 4 provided against each question, and which is most appropriate to the question.

(4) The OMR Response Sheet will be invalidated if more than one circle is shaded using ink / ball pen.

(MIN)

MINING ENGINEERING

INSTRUCTIONS TO CANDIDATES

1. Candidates should write their Hall Ticket Number only in the space provided at the top left hand corner of this page, on the leaflet attached to this booklet and also in the space provided on the OMR Response Sheet. **BESIDES WRITING, THE CANDIDATE SHOULD ENSURE THAT THE APPROPRIATE CIRCLES PROVIDED FOR THE HALL TICKET NUMBERS ARE SHADED USING H.B. PENCIL ONLY ON THE OMR RESPONSE SHEET. DO NOT WRITE HALL TICKET NUMBER ANY WHERE ELSE.**
2. Immediately on opening this Question Paper Booklet, check:
   (a) Whether **200** multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
   (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using H.B. pencil only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
6. **Candidate shall shade one of the circles 1, 2, 3 or 4 corresponding question on the OMR Response Sheet using H.B. Pencil only. Candidate should note that their OMR Response Sheet will be invalidated if the circles against the question are shaded using Black / Blue ink pen / Ball pen / any other pencil other than H.B. Pencil or if more than one circle is shaded against any question.**
7. One mark will be awarded for every correct answer. **There are no negative marks.**
8. The OMR Response Sheet will not be valued if the candidate :
   (a) Writes the Hall Ticket Number in any part of the OMR Response Sheet except in the space provided for the purpose.
   (b) Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.
   (c) Adopts any other malpractice.
9. Rough work should be done only in the space provided in the Question Paper Booklet.
10. No loose sheets or papers will be allowed in the examination hall.
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of **32** pages including Cover page and the pages for Rough Work.

MATHEMATICS

1. If $A=\begin{bmatrix}3 & 0 & 0\\ 0 & 3 & 0\\ 0 & 0 & 3\end{bmatrix}$, then $A^4=$

(1) 3I (2) 9I (3) 27I (4) 81I

2. If $A=\begin{bmatrix}0 & 2 & 1\\ -2 & 0 & -2\\ -1 & x & 0\end{bmatrix}$ is a skew symmetric matrix, then the value of x is

(1) 1 (2) 2 (3) 3 (4) 4

3. What is the number of all possible matrices with each entry as 0 or 1 if the order of matrices is 3×3

(1) 64 (2) 268 (3) 512 (4) 256

4. If $A=\begin{bmatrix}1 & i & -i\\ i & -i & 1\\ -i & 1 & i\end{bmatrix}$, then $|A|=$

(1) 1 (2) 2 (3) 3 (4) 4

5. The solution of a system of linear equations $2x-y+3z=9, x+y+z=6, x-y+z=2$ is

(1) $x=-1, y=-2, z=-3$ (2) $x=3, y=2, z=1$

(3) $x=2, y=1, z=3$ (4) $x=1, y=2, z=3$

6. If $\frac{1}{x^2+a^2}=\frac{A}{x+ai}+\frac{B}{x-ai}$ then A = _____, B = _____.

(1) $\frac{1}{2ai}, -\frac{1}{2ai}$ (2) $-\frac{1}{2ai}, \frac{1}{2ai}$ (3) $\frac{1}{ai}, -\frac{1}{ai}$ (4) $-\frac{1}{ai}, \frac{1}{ai}$

7. If $\frac{2x+4}{(x-1)^3}=\frac{A_1}{(x-1)}+\frac{A_2}{(x-1)^2}+\frac{A_3}{(x-1)^3}$ then $\sum_{i=1}^{3} A_i$ is equal to

(1) A_2 (2) $2A_2$ (3) $4A_2$ (4) $4A_1$

8. The period of the function $f(x) = |\sin x|$ is

(1) π (2) 2π (3) 3π (4) 4π

9. If A+B=45°, then (1−cotA) . (1−cotB) is

(1) 1 (2) 0 (3) 2 (4) −1

10. The value of sin 78° + cos 132° is

(1) $\frac{\sqrt{5}+1}{4}$ (2) $\frac{\sqrt{5}+1}{2}$ (3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{5}-1}{4}$

11. If A+B+C = π, then sin2A + sin2B + sin2C =

(1) 4 cosA sinB cosC (2) 4 sinA cosB sinC

(3) 4 cosA cosB cosC (4) 4 sinA sinB sinC

12. The principal solution of Tanx = 0 is

(1) $x = n\pi, n\in Z$ (2) $x=0$

(3) $x=(2n+1)\,\pi/2, n\in Z$ (4) $x = n\pi+\alpha, n\in Z$

13. The value of $\text{Tan}^{-1}(2) + \text{Tan}^{-1}(3)$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{3\pi}{4}$

14. If the sides of a right angle triangle are in A.P., then the ratio of its sides is

(1) 1:2:3 (2) 2:3:4 (3) 3:4:5 (4) 4:5:6

15. The value of $r.r_1.r_2.r_3$ is

(1) Δ^2 (2) Δ^{-2} (3) Δ^{-3} (4) Δ^4

16. $\frac{1}{r1}+\frac{1}{r2}+\frac{1}{r3}=$

(1) $\frac{1}{r}$ (2) $\frac{1}{2r}$ (3) $\frac{1}{R}$ (4) $\frac{1}{\Delta}$

17. If $a=6$, $b=5$, $c=9$, then the value of angle A is

(1) $\cos^{-1}(2/9)$ (2) $\cos^{-1}(2/5)$ (3) $\cos^{-1}(7/9)$ (4) $\cos^{-1}(1/3)$

18. The polar form of complex number $1-i$ is

(1) $\sqrt{2}\,e^{-i\pi/4}$ (2) $\sqrt{2}\,e^{i\pi/4}$ (3) $\sqrt{2}\,e^{i\pi/2}$ (4) $\sqrt{2}\,e^{-i\pi/2}$

19. If $1, \omega, \omega^2$ be the cube roots of unity, then the value of $2^{\omega^3}.2^{\omega^5}.2^{\omega}$ is

(1) ω (2) ω^2 (3) 1 (4) 0

20. The intercept made on X-axis by the circle $x^2+y^2+2gx+2fy+c=0$ is

(1) $\sqrt{g^2-c}$ (2) $\sqrt{f^2-c}$ (3) $2.\sqrt{g^2-c}$ (4) $2.\sqrt{f^2-c}$

21. If one end of the diameter of the circle $x^2+y^2-5x-8y+13=0$ is (2, 7), then the other end of the diameter is

(1) (3, 1) (2) (1, 3) (3) (−3, −1) (4) (−1, −3)

22. The radius of the circle $\sqrt{1+m^2}(x^2+y^2) - 2cx - 2mcy = 0$ is

(1) $2c$ (2) $4c$ (3) $c/2$ (4) c

23. The parametric equations of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are

(1) $x = a\sec\theta, y = b\tan\theta$ (2) $x = b\sin\theta, y = a\cos\theta$

(3) $x = a\cos\theta, y = b\sin\theta$ (4) $x = a\operatorname{cosec}\theta, y = b\cot\theta$

24. The equation of the directrix of the parabola $2x^2 = -7y$ is

(1) $8y+7=0$ (2) $8y-7=0$ (3) $7y+8=0$. (4) $8x-7=0$

25. The condition for a straight line $y = mx+c$ to be a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is

(1) $c = a/m$ (2) $c^2 = a^2m^2 - b^2$ (3) $c^2 = a^2m^2 + b^2$ (4) $c^2 = a/m$

26. $\underset{x\to 1}{Lt}\ \frac{\sqrt{5x-4}-\sqrt{x}}{x-1}$ is

(1) 3 (2) 2 (3) 4 (4) 1

27. $\log i =$

(1) $\pi/2$ (2) $\pi/4$ (3) $i\pi/2$ (4) $i\pi/4$

28. $\frac{d}{dx}[\log_7 X] =$

(1) $\frac{1}{x}$ (2) $X\log_7^e$ (3) $\frac{1}{x}\log^7_e$ (4) $\frac{1}{x}\log_7^e$

29. $\frac{d}{dx}[2\cosh x] =$

(1) $\frac{e^x+e^{-x}}{2}$ (2) $\frac{e^x-e^{-x}}{2}$ (3) e^x+e^{-x} (4) e^x-e^{-x}

30. $\frac{d}{dx}\left[\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right]=$

(1) $\frac{1}{1+x^2}$ (2) $\frac{-1}{1+x^2}$ (3) $\frac{2}{1+x^2}$ (4) $\frac{-2}{1+x^2}$

31. If $x = at^2, y = 2at$, then $\frac{dy}{dx}=$

(1) $\sqrt{\frac{y}{x}}$ (2) $\sqrt{\frac{x}{a}}$ (3) $\sqrt{\frac{a}{x}}$ (4) $\sqrt{\frac{x}{y}}$

32. The derivative of e^x with respect to $\sqrt{x}$ is

(1) $\frac{2\sqrt{x}}{e^x}$ (2) $2\sqrt{x}\,e^x$ (3) $\frac{e^x}{2\sqrt{x}}$ (4) $\sqrt{x}.e^x$

33. The equation of the normal to the curve $y = 5x^4$ at the point (1, 5) is

(1) $x + 20y = 99$ (2) $x + 20y = 101$ (3) $x - 20y = 99$ (4) $x - 20y = 101$

34. The angle between the curves $y^2 = 4x$ and $x^2 + y^2 = 5$ is

(1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$ (3) $\tan^{-1}(3)$ (4) $\tan^{-1}(4)$

35. If $u = x^3y^3$ then $\frac{\partial^3 u}{\partial x^3}+\frac{\partial^3 u}{\partial y^3}=$

(1) $6\,(x^3+y^3)$ (2) $6\,x^3\,y^3$ (3) $6x^3$ (4) $6y^3$

36. $\int \operatorname{cosec} x\,dx=$

(1) $\log(\operatorname{cosec} x + \cot x) + C$ (2) $\log(\cot x/2) + C$

(3) $\log(\tan x/2) + C$ (4) $-\operatorname{cosec} x.\cot x + C$

37. $\int_0^{\frac{\pi}{2}} \cos^{11} x \, dx =$

(1) $\frac{256}{693}$ (2) $\frac{256\pi}{693}$ (3) $\frac{\pi}{4}$ (4) $\frac{128}{693}$

38. $\int f'(x).[f(x)]^n \, dx =$

(1) $\frac{[f(x)]^{n-1}}{n-1}+C$ (2) $\frac{[f(x)]^{n+1}}{n+1}+C$ (3) $n[f(x)]^{n-1}+C$ (4) $(n+1)[f(x)]^{n+1}+C$

39. $\int \frac{dx}{(x+7)\sqrt{x+6}} =$

(1) $Tan^{-1}(\sqrt{x+6})+C$ (2) $2Tan^{-1}(\sqrt{x+6})+C$

(3) $Tan^{-1}(x+7)+C$ (4) $2Tan^{-1}(x+7)+C$

40. $\int \tan^{-1} x \, dx =$

(1) $x.Tan^{-1}x+\frac{1}{2}\log(1+x^2)+C$ (2) $\frac{1}{1+x^2}+C$

(3) $x^2.Tan^{-1}x+C$ (4) $x.Tan^{-1}x-\log\sqrt{1+x^2}+C$

41. $\int \frac{dx}{1+e^{-x}} =$

(1) $\log(1+e^{-x})+C$ (2) $\log(1+e^{x})+C$

(3) $e^{-x}+C$ (4) $e^{x}+C$

42. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin|x| \, dx =$

(1) 0 (2) 1 (3) 2 (4) -1

43. Area under the curve $f(x) = \sin x$ in $[0, \pi]$ is
(1) 4 sq. units (2) 2 sq. units (3) 6 sq. units (4) 8 sq. units

44. The order of $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} - 3y = x$ is
(1) 1 (2) 4 (3) 3 (4) 2

45. The degree of $\left[\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = a\frac{d^2y}{dx^2}$ is
(1) 4 (2) 2 (3) 1 (4) 3

46. The family of straight lines passing through the origin is represented by the differential equation
(1) $ydx + xdy = 0$ (2) $xdy - ydx = 0$ (3) $xdx + ydy = 0$ (4) $xdx - ydy = 0$

47. The differential equitation $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$ is called
(1) Homogeneous (2) Exact (3) Linear (4) Legender

48. The solution of differential equation $\frac{dy}{dx} = e^{-x^2} - 2xy$ is
(1) $y.e^{-x^2} = x + c$ (2) $ye^x = x + c$ (3) $ye^{x^2} = x + c$ (4) $y = x + c$

49. The complementary function of $(D^3+D^2+D+1)\,y = 10$ is
(1) $C_1\cos x + C_2\sin x + C_3e^{-x}$ (2) $C_1\cos x + C_2\sin x + C_3e^x$
(3) $C_1 + C_2\cos x + C_3\sin x$ (4) $(C_1 + C_2x + C_3x^2)\,e^x$

50. Particular Integral of $(D-1)^4y = e^x$ is
(1) $x^4\,e^x$ (2) $\frac{x^4}{24}e^{-x}$ (3) $\frac{x^4}{12}e^x$ (4) $\frac{x^4}{24}e^x$

Set Code : T2

Booklet Code : A

PHYSICS

51. Two quantities A and B are related by the relation A/B = m where m is linear mass density and A is force. The dimensions of B will be

(1) same as that of latent heat (2) same as that of pressure

(3) same as that of work (4) same as that of momentum

52. The dimensional formula of capacitance in terms of M, L, T and I is

(1) $[ML^2T^2I^2]$ (2) $[ML^{-2}T^4I^2]$ (3) $[M^{-1}L^3T^3I]$ (4) $[M^{-1}L^{-2}T^4I^2]$

53. If l, m and n are the direction cosines of a vector, then

(1) $l + m + n = 1$ (2) $l^2 + m^2 + n^2 = 1$ (3) $\frac{1}{l}+\frac{1}{m}+\frac{1}{n}=1$ (4) $lmn = 1$

54. The angle between i+j and j+k is

(1) 0° (2) 90° (3) 45° (4) 60°

55. A particle is moving eastwards with a velocity of 5 ms^{-1}. In 10 seconds the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is

(1) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-west (2) zero

(3) $\frac{1}{2}$ ms^{-2} towards north (4) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-east

56. The linear momentum of a particle varies with time t as $p = a+bt+ct^2$ which of the following is correct?

(1) Force varies with time in a quadratic manner.

(2) Force is time-dependent.

(3) The velocity of the particle is proportional to time.

(4) The displacement of the particle is proportional to t.

57. A shell of mass m moving with a velocity v suddenly explodes into two pieces. One part of mass $m/4$ remains stationary. The velocity of the other part is

(1) v (2) $2v$ (3) $3v/4$ (4) $4v/3$

58. The velocity of a freely falling body after 2s is
(1) 9.8 ms^{-1} (2) 10.2 ms^{-1} (3) 18.6 ms^{-1} (4) 19.6 ms^{-1}

59. A large number of bullets are fired in all directions with the same speed u. The maximum area on the ground on which these bullets will spread is

(1) $\frac{\pi u^2}{g^2}$ (2) $\frac{\pi u^4}{g^2}$ (3) $\frac{\pi u^2}{g^4}$ (4) $\frac{\pi u}{g^4}$

60. The minimum stopping distance for a car of mass m, moving with a speed v along a level road, if the coefficient of friction between the tyres and the road is μ, will be

(1) $\frac{v^2}{2\mu g}$ (2) $\frac{v^2}{\mu g}$ (3) $\frac{v^2}{4\mu g}$ (4) $\frac{v}{2\mu g}$

61. When a bicycle is in motion, the force of friction excreted by the ground on the two wheels is such that it acts
(1) In the backward direction on the front wheel and in the forward direction on the rear wheel
(2) In the forward direction on the front wheel and in the backward direction on the rear wheel
(3) In the backward direction on both the front and the rear wheels
(4) In the forward direction on both the front and the rear wheels

62. In a perfectly inelastic collision, the two bodies
(1) strike and explode (2) explode without striking
(3) implode and explode (4) combine and move together

63. Under the action of a constant force, a particle is experiencing a constant acceleration, then the power is
(1) zero (2) positive
(3) negative (4) increasing uniformly with time

64. Consider the following two statements:

A : Linear momentum of a system of particles is zero.

B : Kinetic energy of a system of particles is zero.

Then

(1) A implies B & B implies A (2) A does not imply B & B does not imply A

(3) A implies B but B does not imply A (4) A does not imply B but B implies A

65. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Given $g = 10\ ms^{-2}$)

(1) 4s (2) 5s (3) 8s (4) 10s

66. If a spring has time period T, and is cut into n equal parts, then the time period will be

(1) $T\sqrt{n}$ (2) $\frac{T}{\sqrt{n}}$ (3) nT (4) T

67. When temperature increases, the frequency of a tuning fork

(1) increases

(2) decreases

(3) remains same

(4) increases or decreases depending on the materials

68. If a simple harmonic motion is represented by $\frac{d^2x}{dy^2}+\alpha x=0$, its time period is

(1) $2\pi\sqrt{\alpha}$ (2) $2\pi\alpha$ (3) $\frac{2\pi}{\sqrt{\alpha}}$ (4) $\frac{2\pi}{\alpha}$

69. A cinema hall has volume of 7500 m^3. It is required to have reverberation time of 1.5 seconds. The total absorption in the hall should be

(1) 850 w-m^2 (2) 82.50 w-m^2 (3) 8.250 w-m^2 (4) 0.825 w-m^2

70. To absorb the sound in a hall which of the following are used
(1) Glasses, stores (2) Carpets, curtains
(3) Polished surfaces (4) Platforms

71. If N represents avagadro's number, then the number of molecules in 6 gm of hydrogen at NTP is
(1) 2N (2) 3N (3) N (4) N/6

72. The mean translational kinetic energy of a perfect gas molecule at the temperature T K is
(1) $\frac{1}{2}kT$ (2) kT (3) $\frac{3}{2}kT$ (4) $2kT$

73. The amount of heat given to a body which raises its temperature by 1°C
(1) water equivalent (2) thermal heat capacity
(3) specific heat (4) temperature gradient

74. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio *Cp/Cv* for gas is
(1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$

75. Cladding in the optical fiber is mainly used to
(1) to protect the fiber from mechanical stresses
(2) to protect the fiber from corrosion
(3) to protect the fiber from mechanical strength
(4) to protect the fiber from electromagnetic guidance

CHEMISTRY

76. The valency electronic configuration of Phosphorous atom (At.No. 15) is
(1) $3s^2\ 3p^3$ (2) $3s^1\ 3p^3\ 3d^1$ (3) $3s^2\ 3p^2\ 3d^1$ (4) $3s^1\ 3p^2\ 3d^2$

77. An element 'A' of At.No.12 combines with an element 'B' of At.No.17. The compound formed is
(1) covalent AB (2) ionic AB_2 (3) covalent AB_2 (4) ionic AB

78. The number of neutrons present in the atom of $_{56}Ba^{137}$ is
(1) 56 (2) 137 (3) 193 (4) 81

79. Hydrogen bonding in water molecule is responsible for
(1) decrease in its freezing point (2) increase in its degree of ionization
(3) increase in its boiling point (4) decrease in its boiling point

80. In the HCl molecule, the bonding between hydrogen and chlorine is
(1) purely covalent (2) purely ionic (3) polar covalent (4) complex coordinate

81. Potassium metal and potassium ions
(1) both react with water (2) have the same number of protons
(3) both react with chlorine gas (4) have the same electronic configuration

82. 5.85 gms of sodium chloride were dissolved in water and the solution made upto 100 ml in a standard flask. 10 ml of this solution were pipetted out into another flask and made up with distilled water into 100 ml of solution. The concentration of the sodium chloride solution now is
(1) 0.1 M (2) 1.0 M (3) 0.5 M (4) 0.25 M

83. Concentration of a 1.0 M solution of phosphoric acid in water is
(1) 0.33 N (2) 1.0 N (3) 2.0 N (4) 3.0 N

84. Which of the following is a Lewis acid?
(1) Ammonia (2) Berylium chloride
(3) Boron trifluoride (4) Magnesium oxide

85. Which of the following constitutes the components of a buffer solution?
(1) Potassium chloride and potassium hydroxide
(2) Sodium acetate and acetic acid
(3) Magnesium sulphate and sulphuric acid
(4) Calcium chloride and calcium acetate

86. Which of the following is an electrolyte?
(1) Acetic acid (2) Glucose (3) Urea (4) Pyridine

87. Calculate the Standard emf of the cell, $Cd/Cd^{+2}//Cu^{+2}/Cu$ given that $E^0\ Cd/Cd^{+2} = 0.44V$ and $E^0\ Cu/Cu^{+2} = (-)\ 0.34\ V$.
(1) (–) 1.0 V (2) 1.0 V (3) (–) 0.78 V (4) 0.78 V

88. A solution of nickel chloride was electrolysed using Platinum electrodes. After electrolysis,
(1) nickel will be deposited on the anode (2) Cl_2 gas will be liberated at the cathode
(3) H_2 gas will be liberated at the anode (4) nickel will be deposited on the cathode

89. Which of the following metals will undergo oxidation fastest?
(1) Cu (2) Li (3) Zinc (4) Iron

90. Which of the following cannot be used for the sterilization of drinking water?
(1) Ozone (2) Calcium Oxychloride
(3) Potassium Chloride (4) Chlorine water

91. A water sample showed it to contain 1.20 mg/litre of magnesium sulphate. Then, its hardness in terms of calcium carbonate equivalent is
(1) 1.0 ppm (2) 1.20 ppm (3) 0.60 ppm (4) 2.40 ppm

92. Soda used in the L-S process for softening of water is, Chemically.
(1) sodium bicarbonate (2) sodium carbonate decahydrate
(3) sodium carbonate (4) sodium hydroxide (40%)

93. The process of cementation with zinc powder is known as
(1) sherardizing (2) zincing (3) metal cladding (4) electroplating

94. Carrosion of a metal is fastest in
(1) rain-water (2) acidulated water (3) distilled water (4) de-ionised water

95. Which of the following is a thermoset polymer?
(1) Polystyrene (2) PVC
(3) Polythene (4) Urea-formaldehyde resin

96. Chemically, neoprene is
(1) polyvinyl benzene (2) polyacetylene
(3) polychloroprene (4) poly-1,3-butadiene

97. Vulcanization involves heating of raw rubber with
(1) selenium element (2) elemental sulphur
(3) a mixture of Se and elemental sulphur (4) a mixture of selenium and sulphur dioxide

98. Petrol largely contains
(1) a mixture of unsaturated hydrocarbons C_5 - C_8
(2) a mixture of benzene, toluene and xylene
(3) a mixture of saturated hydrocarbons C_{12} - C_{14}
(4) a mixture of saturated hydrocarbons C_6 - C_8

99. Which of the following gases is largely responsible for acid-rain?
(1) SO_2 & NO_2 (2) CO_2 & water vapour
(3) CO_2 & N_2 (4) N_2 & CO_2

100. BOD stands for
(1) Biogenetic Oxygen Demand (2) Biometric Oxygen Demand
(3) Biological Oxygen Demand (4) Biospecific Oxygen Demand

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MINING ENGINEERING

101. The core (dia in mm) size obtained with NX size
(1) 21 (2) 28
(3) 40 (4) 54

102. Bore hole deviation is _____ degrees for 30 m.
(1) 1 (2) 2
(3) 3 (4) 4

103. The following safety device is provided in sinking shaft in case of overwind
(1) spider (2) kibble
(3) detaching hook (4) rider

104. The method of sinking adopted in unstable or friable strata with heavy inrush of water encountered is
(1) German tubing (2) forced drop
(3) cementation method (4) freezing method

105. The Velocity of detonation of premix cartridge is
(1) 5000 m/s (2) 7000 m/s
(3) 3500 m/s (4) 3200 m/s

106. The constituents in slurry explosive (TNT : AN: Water)
(1) 20:15:65 (2) 20:65:15
(3) 15:20:65 (4) 65:15:20

107. Relieving hole should be drilled at least ___ m away from the misfired hole in the under ground.
(1) 1 (2) 0.5
(3) 0.3 (4) 0.2

108. The pattern of cut mostly preferred for laminated strata is
(1) Ring drilling (2) fan cut (3) pyramid cut (4) burn cut

109. To get lumpy coal or to minimize the coal dust the blasting technique adopted is
(1) cushion blasting (2) muffled blasting
(3) coyote blasting (4) pop shooting

110. In roof stitching the face should not be advanced more than ____ m from the last tensioned rope
(1) 4 m (2) 3 m (3) 2.4 m (4) 2 m

111. In sand stowing incorrect profile will leads to
(1) cavitations (2) wear on pipes
(3) setup pulsation (4) jamming

112. Ring rose detector works on the principle of
(1) Formation of gas cap (2) Wheatstone bridge
(3) Diffusion-combustion-contraction (4) Optical properties

113. The elements in the delay element of short delay detonator
(1) Antimony and potassium permanganate
(2) Red lead and silicon
(3) silicon and Antimony
(4) PETN and ASA

114. Cone sheets are
(1) Sills (2) Dykes
(3) folds (4) faults

115. Stocks of circular out crop, upon the surface are known as
(1) Volcanic necks (2) Lopoliths
(3) Laccoliths (4) Bosses

116. The upper portion of regolith, under suitable condition, transformed into _____
(1) Sand (2) Alluvial (3) Silt (4) Soil

117. Granulite is a
(1) Plutonic Rock (2) Sedimentary rock
(3) Metamorphic rock (4) Igneous rock

118. The following is NOT a process of erosion caused by blowing wind.
(1) denudation (2) deflation
(3) abration (4) attrition

119. The following is a process for formation of Canyon
(1) down cutting of a valley floor (2) over and side cutting the valley floor
(3) under cutting of a plateau floor (4) washing out the plateau floor

120. Slumbering volcano is also known as
(1) Active volcano (2) dormant volcano
(3) Extinct volcano (4) Stromboli volcano

121. Push waves of earth quakes are transmitted due to _____ set up within the earth.
(1) Transverse vibration (2) Longitudinal vibrations
(3) Diagonal vibrations (4) Radial vibrations

122. If the upper younger rocks spread covering the older rock it is known as
(1) Unconformity (2) joints (3) Inlier (4) Overlap

123. The cuddapah system is convex towards the _____ while its concavity lies towards the_____.
(1) East, West (2) West, East
(3) North, South (4) South, North

124. Quartz is a common gangue mineral associated with the ore mineral _____
(1) Bauxite (2) Haematite
(3) Chalcopyrite (4) Galena

125. Molecular or even atomic substitution takes place in_____ process.
(1) Stock work (2) Saddle reef
(3) Metasomatic replacement (4) Sublimation

126. The average number of faces in a district if number of headings are 'N'
(1) 2N-1 (2) 2(N-1) (3) 2N-2 (4) 2(N-3)

127. With a good sandstone roof the area exposed may not more than ____ sq.m at one stook extraction and ____ sq.m if 3-4 stooks under extraction.
(1) 20; 400 (2) 30; 600
(3) 40; 900 (4) 50; 900

128. In a seam with locomotive haulage system the junctions with main headings are staggered
(1) for easy travelling of loco (2) to minimize roof exposure
(3) to reduce ventilation air loss (4) to prevent the speed of loco

129. For designing pillars _____ is used.
(1) coward's diagram (2) proximate analysis
(3) monographs (4) pentagraph

130. If the depillaring is proceeding from dip to rise and seam inclination is not mild so that goaf can be submerged in water then the line of goaf is _____
(1) Diagonal (2) Step diagonal
(3) parallel to strike (4) Arrow head

131. The face formed which is developed on bord and pillar method and extracting in longwall retreating with stowing is called
(1) Z shape face (2) Barry face
(3) Bleeder road method (4) double unit face

132. Roadway reutilization is possible in _____longwall face.
(1) Single unit (2) Double unit(advancing)
(3) Z unit (4) retreating

133. Inclined slicing in descending order is applicable if the seam inclination is
(1) less than 35° (2) more than 35°
(3) less than 45 and more than 35° (4) more than 45°

134. In respect of dipper shovel "crowding" means
(1) raising bucket to dumper height
(2) Piercing the bucket into broken mineral
(3) winging the bucket round
(4) moving the shovel from one place to another

135. Chock shields can work in steeply inclined seams up to maximum ____deg.
(1) 45 (2) 60 (3) 70 (4) 85

136. Alimak raise climber can be used only where inclination of the raise from horizontal is
(1) 10 deg (2) 20 deg (3) 30 deg (4) 40 deg

137. Raising by long hole drilling is limited to
(1) 10 to 15 m (2) 15 to 50 m (3) 50 to 100 m (4) 100 to 120 m

138. The mineral is transported downwards in different sections to the lower level and all the ore is carried to crusher at lowest level through
(1) Mine tubs (2) Winzes
(3) Ore passes (4) Hoists of small capacity

139. In vertical crater retreat method the spherical charges are used L:D should not exceed is
(1) 1:4 (2) 4:1 (3) 6:1 (4) 1:6

140. The method of stoping best suited to low grade deposits of horizontal or mild dip and of thickness upo 5 m is
(1) Open stoping (2) Breast stoping
(3) Sublevel stoping (4) Shrinkage stoping

141. The method of stoping, suitable for thick ore body strong ore stable handing and foot wall steeply dipping ore is
(1) Open stoping (2) Shrinkage stoping
(3) Cut and fill stoping (4) Sublevel stoping

142. The method of stoping, suitable for steeply dipping reasonably firm ore mixed graded ore with irregular boundaries and where ground surface is to be protected from subsidence is
(1) Open stoping (2) Shrinkage stoping
(3) Cut and fill stoping (4) Sublevel stoping

143. The dilution in sublevel caving is
(1) 10 to 35% (2) 35 to 45%
(3) 45 to 60% (4) above 60%

144. The method of stoping, for high grade ore with walls of the ore body and back of the stope are so weak which do not stand without support even for a week time is
(1) Sublevel stoping (2) Shrinkage stoping
(3) Square set stoping (4) Cut and fill stoping

145. Recovery of ore by shrinkage stoping, is
(1) 40 to 50% (2) 50 to 60% (3) 60 to 75% (4) 75 to 90%

146. In the centrifugal fan smooth flow air and conversion of velocity energy into pressure energy takes place
(1) In spiral casing (2) In the blades
(3) At the tip of the blades (4) In the evasee

147. The maximum permissible speed of the axial flow fan is
(1) 8000 m/min (2) 6000 m/min (3) 5200 m/min (4) 4200 m/min

148. In a mine of high resistance the series arrangement of fans gives a considerable increase in the quantity of air flowing is
(1) 10% (2) 20% (3) 30% (4) 40%

149. On reversal of air current by axial flow fan the quantity of air reduces to..
(1) 20% (2) 30% (3) 40% (4) 60%

150. If the booster is placed in bye of the neutral line
(1) Leakage is maximum (2) Zone of recirculation takes place
(3) Fan will damage (4) Leakage is minimum

151. Interferometers works on the principle of
(1) Formation of gas cap (2) Wheatstone bridge
(3) Infra radiation (4) Optical properties

152. The quantity of air to be circulated by an auxiliary fan depends upon
(1) Lenght of the heading
(2) Number of persons in the drift
(3) Size fo the drift
(4) Rate of emission in the roadway

153. The coal is not liable to spontaneous heating if the coal has oxygen content
(1) less than 2% (2) 4% (3) 8% (4) more than 9%

154. Ignition temperature of methane is
(1) 250-350°c (2) 350-650°c (3) 650-750°c (4) 750-1000°c

155. For coal dust explosion the quantity of coal is _____ g/m^3
(1) 10 (2) 20 (3) 30 (4) 40

156. Hoolamite is a mixture of
(1) Manganese dioxide + coper oxide
(2) Potassium superoxide+copper oxide
(3) Silica gel + potassium palladium suplhate
(4) Iodine pentoxide + suplhuric acid

157. The CO_2 absorbent used in prototype breathing apparatus is
(1) Calcium hydroxide and Sodium hydroxide
(2) Calcium carbonate and caustic soda
(3) Sodium hydroxide and caustic soda
(4) Calcium hydroxide and caustic soda

158. The minimum average lumens/sq.ft of light at roadways is
(1) 1.5 (2) 1.25 (3) 0.4 (4) 0.9

159. The wire gauge in flame safety lamp should have a total heat radiation area of not less than
(1) 400 sq.m (2) 355 sq.m (3) 250 sq.m (4) 155 sq.m

160. While approaching a water logged area with safety boring apparatus an emergency shutoff door shall be built away from the site of boring machine at a distance of
(1) 10 m (2) 15 m (3) 20 m (4) 25 m

161. If the smallest division of a vernier is longer than the smallest division of the main scale, the vernier is called_____
(1) Microptic (2) Retrograde (3) Vertical vernier (4) Vernier difference

162. The accuracy of a chain survey is
(1) 1/250 to 1/1000 (2) 1/125 to 1/249
(3) 1/25 to 1/100 (4) 1/125 to 1/150

163. Which is the following scale smallest one?
(1) 1cm=10m (2) R.F=1/5000 (3) 1:10000 (4) 1cm=10km

164. If the bearings of the two lines AB and CB are S45°E and N45°W, then the angle ABC equals to _____
(1) 90° (2) 180° (3) 135° (4) 360°

165. If the fore bearing of AB is N35°E, then the fore bearing of BA is _____
(1) N35°E (2) S35°W (3) S65°W (4) S35°E

166. In subtense method of tacheometry i =____
(1) np (2) n/p (3) n + p (4) n – p

167. The correction for refraction is _____that of curvature and _____ to the observed staff reading.
(1) one-seventh, additive (2) one-seventh, subtractive
(3) one-seventeenth, additive (4) one-seven hundredth, additive

168. Permissible error in underground leveling

(1) 2 cm per km (2) 1 mm per km (3) 4 cm per km (4) 4 mm per km

169. The following is NOT a feature of tacheometer

(1) the telescope should be powerful having magnifition of 20 to 30 diameters

(2) the aperture of the objective should be 350 to 450 mm in diameter in order to have sufficiently bright image

(3) the magnifying power of the eye piece should be greater to render the staff graduation clearer at a long distance

(4) the telescope should be fitted with an analytic lens.

170. If the reading of the verniers on the vertical circle is not zero when the line of sight is horizontal the error knwon as

(1) Residual error (2) Index error

(3) graduation error (4) Natural error

171. The upper plate of a theodolite is fixed to_____

(1) horizontal circle (2) inner spindle

(3) outer spindle (4) vertical circle

172. The length of long chord and the tangent of a circular curve of radius R will be equal if the angle of deflection is

(1) 30° (2) 60° (3) 90° (4) 120°

173. The degree of accuracy in secondary triangulation is_____

(1) 1 in 50000 (2) 1 in 5000 (3) 1 in 500 (4) 1 in 50

174. Where entry to a mine is gained by means of a drift, correlation is carried out by

(1) Co-planning method (2) Alignment method

(3) Direct traversing method (4) Approximate alignment method

175. Weisbach method of correlation is also known as
(1) Direct alignment method (2) approximate alignment method
(3) direct traversing method (4) Co-planning method

176. The type of rope most suitable for balancing rope in koepe winding is
(1) Regular lay (2) Locked coil
(3) Flattened strand (4) Spiral strand

177. Internal stresses of the rope can be relieved with the use of
(1) Normalising the wire (2) Annealing the wire
(3) Performed wire (4) Warrington pattern

178. The exhaust gases from the engine amounting in all to about ___ cu.m per B.H.P per minute.
(1) 0.58 (2) 0.654 (3) 0.850 (4) 0.085

179. The steepest gradient in favour of load in loco is determined by
(1) Tractive effort required (2) Load on the train
(3) Braking effort (4) Drawbar pull

180. Where the series of belt conveyors are used for transport of coal there shall be
(1) Remote control (2) Sequence control
(3) Single point control (4) Multipoint control

181. The valve used for priming before start is
(1) Foot valve (2) Retainning valve
(3) Byepass valve (4) Sluice valve

182. The pitch of the stator is _____ of the rotor in roto pump
(1) equal (2) twice (3) thrice (4) 1/2

183. The rope used for track rope in aerial rope way is _____
(1) Locked coil (2) Lang's lay
(3) Regular lay (4) Flattened strand

184. The electric dill is capable of drilling ____ holes each 1.5 m depth in 8 hours shift.
(1) 60 (2) 70 (3) 80 (4) 100

185. The cutting unit of continuous miner of borer type the gearing is
(1) Compound wheel type (2) Spur gearing
(3) Bevel type (4) Sun and planet

186. The power is supplied to the coal drill is the
(1) 5 core armoured cable (2) 3 core armoured cable
(3) 4 core screened cable (4) 5 core screened cable

187. The most common type of flame proof protection is
(1) Hermitically sealed protection (2) Flange protection
(3) Hinge protection (4) Open protection

188. All signaling apparatus in third degree gassy coal mine must be _____
(1) Flame proof apparatus (2) Hermitically sealed protection
(3) Flange protection (4) Intrinsically safe

189. In koepe winding the over wind is prevented by
(1) Detaching hook (2) Automatic contrivances
(3) Convergence of the guides (4) Safety hook

190. The pit top and pit bottom arrangement which deals with reasonable output per month and occupies less space is

(1) Run round arrangement (2) Back shunt circuit
(3) Turn table circuit (4) Traverse circuit

191. If the number of persons employed in the mine is 5000 then the quantity of water required is ____

(1) 10000 lit (2) 5000 lit (3) 25000 lit (4) 1500 lit

192. On or before the _____ every year the owner; agent or manager of mine shall exhibit on the notice board at the office of a mine information regarding leave with wages

(1) 20th Feb (2) 1st Jan (3) 1st May (4) 20th May

193. At every mine employing more than _____ persons on any day of the preceding calendar year there shall be provided suitable first aid room

(1) 50 (2) 100 (3) 150 (4) 250

194. Mine rules comes into force on_____

(1) 2nd March 1955 (2) 2nd July 1955
(3) 2nd May 1955 (4) 2nd January 1955

195. Every travelling roadway shall; where the inclination exceeds _____ from the horizontal in addition to steps or ladders with hand rails or ropes shall be provided.

(1) 30° (2) 45° (3) 60° (4) 80°

196. An underground plan showing every important surface feature within the boundaries such as railway etc. which is within _____ of any part of the workings measured on the horizontal plane

(1) 50 m (2) 100 m (3) 150 m (4) 200 m

197. Every detaching bell used in connection with a safety hook shall be examined once in every___
(1) 30 days (2) 3 months (3) 6 months (4) 12 months

198. Every stopping between the main intake and main return airway shall be constructed of masonary or brickwork not less than atleast _____ in thickness.
(1) 15 cm (2) 25 cm (3) 38 cm (4) 50 cm

199. Lockout shall not declare during a pending of conciliation proceedings before a conciliation board and before _____ after the conclusion of such proceeding.
(1) 7 days (2) 14 days (3) 30 days (4) 40 days

200. Mining industry is organized by
(1) Line organization (2) Function organization
(3) Line and staff organization (4) Staff organization