ISRO

Previous Year Paper
Scientist Civil 2015

1. Granite mainly composed of quartz and feldspar particles, is obtained from

   (a) Sedimentary rocks (b) Metamorphic rocks

   (c) Igneous rocks (d) Volcanic rocks

2. Inner part of a timber log surrounding the pitch, is called

   (a) Sapwood (b) Cambium layer

   (c) Heart wood (d) Soft wood

3. Galvanising means covering iron with a thin coat of

   (a) Tin (b) Zinc

   (c) Glaze (d) Coal tar

4. The arrangement of supporting an existing structure by providing supports underneath, is known as

   (a) Shoring (b) Underpinning

   (c) Jacking (d) Piling

5. The type of brick masonry bond in which every course contains both headers and stretchers, is called

   (a) English bond (b) Flemish bond

   (c) Russian bond (d) Mixed bond

6. The depth of an arch is the distance between

   (a) Ground level and springing line

   (b) Crown and springing line

   (c) Crown and ground level

   (d) Intrados and extrados

7. If height of the first storey of a building is 3.25 m and riser is 13 cm, the number of treads required is

(a) 12 (b) 18

(c) 24 (d) 25

8. The pile provided with one or more bulbs in its vertical shaft, is generally known as

(a) Under reamed pile (b) Friction-pile

(c) Bearing-pile (d) Sheet-pile

9. If R is the radius of earth and h is the altitude above mean sea level at a location then correction for length L for reduction to mean sea level is

(a) $(h/R)(L)$ (b) $(h)(L)(R)$

(c) $(R/h)(L)$ (d) $(h/L)(R)$

10. When the bubble of the level tube of a level remains central

(a) Line of sight is horizontal

(b) Axis of the telescope is horizontal

(c) Line of sight is inclined

(d) Geometrical axis of the telescope is horizontal

11. The direction of steepest slope on a contour is

(a) Along the contour

(b) At an angle of 45° to the contour

(c) At right angles to the contour

(d) At an angle of 60° to the contour

12. Closed contours of decreasing values towards their centre, represent

(a) A hill
(b) A depression
(c) A saddle or pass
(d) A river bed

13. The instrument which is used in plane tabling for obtaining horizontal and vertical distances directly without resorting to chaining, is known as

(a) Plane alidade
(b) Telescopic alidade
(c) Clinometer
(d) Tacheometer

14. Longitudes are measured from 0° to

(a) 180° eastward
(b) 180° westward
(c) 180° east or westward
(d) 360° eastward

15. If two equal forces of magnitude P act at an angle θ, their resultant, will be

(a) $P\cos\theta/2$
(b) $2P\sin\theta/2$
(c) $P\tan\theta/2$
(d) $2P\cos\theta/2$

16. The moment of inertia of a hollow circular section whose external diameter is 8 cm and internal diameter is 6 cm, about centroidal axis is

(a) 437.5 cm^4
(b) 337.45 cm^4
(c) 237.5 cm^4
(d) 137.45 cm^4

17. To double the period of oscillation of a simple pendulum

(a) The mass of its bob should be doubled
(b) The mass of its bob should be quadrupled
(c) Its length should be quadrupled
(d) Its length should be doubled

18. For perfectly elastic bodies, the value of coefficient of restitution is

(a) Zero (b) 0.5

(c) 1.0 (d) Between 0 and 1

19. If l is the span of a light suspension bridge whose each cable carries total weight (w) and the central dip is y, the horizontal pull at each support, is

(a) $wl/4y$ (b) $wl/8y$

(c) $wl/2y$ (d) wl

20. A load of 500 kg was lifted through a distance of 13 cm by an effort of 25 kg which moved through a distance of 650 cm. The mechanical advantage of the lifting machine is

(a) 15 (b) 18

(c) 20 (d) 26

21. A simply supported beam of span L carries a total load W which is uniformly distributed. The maximum bending moment M is

(a) WL/2 (b) WL/4

(c) WL/12 (d) WL/8

22. If there are 'm' unknown number forces, 'r' unknown reaction components and 'j' number of joints, then the degree of static indeterminacy of pin-jointed plane frame is given by

(a) $m+r+2j$ (b) $m-r+2j$

(c) $m+r-2j$ (d) $m+r-3j$

23. The property of a material by which it can be beaten or rolled into thin plates, is called

(a) Malleability (b) Ductility

(c) Plasticity (d) Elasticity

24. If the depth of a simply supported beam carrying an isolated load at its centre, is doubled, the deflection of the beam at the centre will be changed by a factor of

(a) 2 (b) 1/2

(c) 8 (d) 1/8

25. Which is the correct statement as per Law of polygon of forces?

(a) If any number of forces acting at point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium

(b) If any number of forces acting at point can be represented in direction and magnitude by the sides of polygon, then the forces are in the equilibrium

(c) If a polygon representing forces acting at a point is closed then forces are in equilibrium

(d) If any number of forces acting at point can be represented in direction and magnitude by the sides of polygon taken in order, then the forces are in equilibrium

26. Degree of kinematic indeterminacy of a pin jointed plane frame is given by

(a) $2j - r$ (b) $j - 2r$

(c) $3j - r$ (d) $2j + r$

27. The shape of fire hose nozzle is generally kept

(a) Divergent (b) Convergent

(c) Convergent divergent (d) Cylindrical

28. Discharge over an ogee weir remains the same as that of

(a) Sharp crested weir (b) Triangular weir

(c) Drowned weir (d) Cippoletti weir

29. The ratio of hydraulic radius of a pipe running full to the hydraulic radius of a square section of a channel running full whose side is equal to the diameter of the pipe is

(a) 1 (b) 1/2

(c) 1/3 (d) 3/4

30. Kinematic viscosity equals to

(a) Dynamic viscosity ÷ density

(b) Dynamic viscosity × density

(c) Dynamic viscosity + density

(d) Pressure ÷ density

31. A fluid in equilibrium can't sustain

(a) Shear stress

(b) Compressive stress

(c) Tensile stress

(d) Bending stress

32. The line of action of the buoyant force acts through the

(a) Centroid of the volume of fluid vertically above the body

(b) Center of the volume of floating body

(c) Center of gravity of any submerged body

(d) Center of volume of the displaced body

33. Match list I with list II

List I		List II	
(A)	The flow is turbulent in pipes	(1)	Reynold number less than 2000
(B)	Proportional to the mean velocity	(2)	Loss of pressure head in laminar flow
(C)	The flow is laminar in pipes	(3)	Reynold number is more than 4000
(D)	Proportional to square of velocity	(4)	Loss of pressure head in turbulent flow

Codes :

	(A)	(B)	(C)	(D)
(a)	1	2	3	4
(b)	3	2	4	1
(c)	3	2	1	4
(d)	1	4	3	2

34. Isohytes are the imaginary lines joining the points of equal

(a) Pressure (b) Height

(c) Humidity (d) Rainfall

35. Match List-I with List-II and select the correct answer using the code given below the Lists:

List-I (Impurity in drinking water)		List-II (Harm caused)	
(A)	Excess of nitrates	(1)	Brackish water
(B)	Excess of fluorides	(2)	Goiter
(C)	Lack of iodides	(3)	Fragile bones
(D)	Excess of chlorides	(4)	Blue babies

Codes :

	(A)	(B)	(C)	(D)
(a)	4	2	3	1
(b)	1	2	3	4
(c)	4	3	2	1
(d)	1	3	2	4

36. Relative humidity is the ratio of actual vapour pressure to the saturation vapour pressure

(a) At the same temperature
(b) At the same pressure
(c) In the same volume
(d) In the same atmosphere

37. Toughness index of a soil is defined as the ratio of

(a) Plasticity index to consistency index
(b) Plasticity index to flow index
(c) Liquidity index to flow index
(d) Consistency index to liquidity index

38. According to BIS classification, the range of silt size particles is

(a) 4.75 mm to 2.00 mm
(b) 2.00 mm to 0.425 mm
(c) 0.425 mm to 0.075 mm
(d) 0.075 mm to 0.002 mm

39. The clay mineral with the largest swelling and shrinkage characteristic is

(a) Kaolinite
(b) Illite
(c) Montmorillonite
(d) Rock minerals

40. A soil has liquid limit = 32, plastic limit = 18, shrinkage limit = 8 and natural moisture content = 22%. What will be its liquidity index and plasticity index?

(a) 0.67 and 15
(b) 0.285 and 14
(c) 0.67 and 25
(d) 0.33 and 20

41. A cohesive soil yields a maximum dry density of 18 kN/m^3 during a standard Proctor Compaction test. If the specific gravity is 2.65, what would be its void ratio?

(a) 0.552 (b) 0.444

(c) 0.712 (d) 0.583

42. Effective stress on soil

(a) Increases voids ratio and decreases permeability

(b) Increases both voids ratio and permeability

(c) Decreases both voids ratio and permeability

(d) Decreases voids ratio and increases permeability

43. The slope of isochrones at any point at a given time indicates the rate of change of

(a) Effective stress with time

(b) Effective stress with depth

(c) Pore water pressure with depth

(d) Pore water pressure with time

44. Clay layer A with single drainage and coefficient of consolidation Cv takes 6 months to achieve 50% consolidation. The time to layer B of the same thickness with double drainage and coefficient of consolidation $\frac{Cv}{2}$ to achieve the same degree of consolidation

(a) 3 months (b) 6 months

(c) 12 months (d) 24 months

45. In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always

(a) Zero
(b) Less than 1
(c) 1
(d) Greater than 1

46. To generate the jth column of the flexibility matrix

(a) A unit force is applied at co-ordinate j and displacements are calculated at all co-ordinates
(b) A unit displacement is applied at co-ordinate j and the forces are calculated at all co-ordinates
(c) A unit force is applied at co-ordinate j and the forces are calculated at all co-ordinates
(d) A unit displacement is applied at co-ordinate j and the displacements are calculated at all co-ordinates

47. The deformation of a spring produced by a unit load is called

(a) Stiffness
(b) Flexibility
(c) Influence coefficient
(d) Unit strain

48. For determining the velocity of flow of underground water, the most commonly used non-empirical formula is

(a) Darcy's formula
(b) Slichter's formula
(c) Hazen's formula
(d) Lacey's formula

49. An aquiclude is

(a) A non artesian aquifer
(b) An artesian aquifer
(c) A solid impermeable layer underlying or overlying an aquifer
(d) A large underground water body

50. Slenderness ratio of a compression member is

(a) Moment of inertia/Radius of gyration

(b) Effective length/Area of cross-section

(c) Effective length/Radius of gyration

(d) Radius of gyration/Area of cross-section

51. The thickness "t" of a single flat lacing should not be less than

(a) 1/30th length between inner end rivets

(b) 1/40th length between inner end rivets

(c) 1/50th length between inner end rivets

(d) 1/60th length between inner end rivets

52. Web crippling generally occurs at the point where

(a) Concentrated load act

(b) Shearing force is minimum

(c) Bending moment is maximum

(d) Deflection is maximum

53. Stiffeners are used in a plate girder

(a) To reduce the compressive stress

(b) To reduce the shear stress

(c) To take the bearing stress

(d) To avoid buckling of web plate

54. The normal scour depth D below the designed flood level of a river may be calculated from the Lacey's equation, where C = Constant, Q = Design flood discharge and f = Silt factor

(a) $D = C(Q/f)$

(b) $D = C(Q/f)^{1/2}$

(c) $D = C(Q/f)^{5/3}$

(d) $D = C(Q/f)^{1/3}$

55. A fall in a canal bed is generally provided, if

(a) Ground slope exceeds the designed bed slope

(b) Designed bed slope exceeds the ground slope

(c) Ground slope is practically the same as the designed bed slope

(d) Canal bed is flat

56. The steepest gradient permitted on roads which, in ordinary conditions, does not exceed, is known

(a) Ruling gradient

(b) Limiting gradient

(c) Exceptional gradient

(d) Floating gradient

57. While calculating the sight distances, the driver's eye above road surface is assumed as

(a) 60 cms

(b) 70 cms

(c) 80 cms

(d) 120 cms

58. The radius of curvature provided along a transition curve, is

(a) Minimum at the beginning and maximum at the end

(b) Same throughout its length

(c) Equal to the radius of circular curve

(d) Varying from infinity at the beginning to the radius of circular curve at the end

59. Staggered rail joints are generally provided

(a) On curves (b) On tangents

(c) On bridges (d) In tunnels

60. The critical activity has

(a) Maximum float (b) Minimum float

(c) Zero float (d) Variable float

61. According to BIS method of measurement, the order of the sequence is

(a) Length, breadth, height

(b) Breadth, length, height

(c) Height, length, breadth

(d) Length, height, breadth

62. Which one of the following types of samples is relatively employed for the design of waste water treatment plants?

(a) Grab sample
(b) Composite sample
(c) Integrated sample
(d) Any sample

63. In very first stage of decomposition of the organic matter in sewage

(a) Nitrites are formed
(b) Nitrates are formed
(c) Carbon dioxide is formed
(d) Ammonia is formed

64. The characteristics of fresh and septic sewage respectively are

(a) acidic and alkaline
(b) alkaline and acidic
(c) both acidic
(d) both alkaline

65. Ultimate strength to cement is provided by

(a) Tri calcium silicate
(b) Di calcium silicate
(c) Tri calcium aluminate
(d) Tetra calcium alumino ferrite

66. Strength of concrete increases with

(a) increase in water cement ratio
(b) increase in fineness of cement
(c) decrease in curing time
(d) decrease in size of aggregate

67. The compressive strength of 100 mm cube of concrete as compared to 150 mm cube is

(a) less

(b) more

(c) equal

(d) less or more as per grade of concrete

68. The individual variation between test strength of concrete cube sample should not be more than

(a) ± 5% of average (b) ± 10% of average

(c) ± 15% of average (d) ± 20% of average

69. The ratio of maximum shear stress to average shear stress of a beam circular in cross-section, is

(a) 2/3 (b) 3/2 (c) 3/4 (d) 4/3

70. In prestressed concrete

(a) forces of tension and compression change but lever arm remains unchanged

(b) forces of tension and compression remains unchanged but lever arm changes with moment

(c) both forces of tension and compression as well as lever arm changes

(d) both forces of tension and compression as well as lever arm remains unchanged

71. The value of $\Delta = \begin{vmatrix} 0 & 1 & 2 & 3 \\ 1 & 0 & 3 & 0 \\ 2 & 3 & 0 & 1 \\ 3 & 0 & 1 & 2 \end{vmatrix}$ is

(a) 56 (b) 88 (c) 2π (d) 0

72. The series $1+\frac{1}{2^2}-\frac{1}{3^2}-\frac{1}{4^2}+\frac{1}{5^2}+\frac{1}{6^2}-\frac{1}{7^2}-\frac{1}{8^2}+\cdots\infty$ is

(a) Divergent
(b) Oscillatory
(c) Conditional convergent
(d) Absolute convergent

73. The complete solution of the linear differential equation

$$\frac{d^2y}{dx^2}+(a+b)\frac{dy}{dx}+aby=0$$

(a) $c_1e^{-ax}+c_2e^{-bx}$ (b) $c_1e^{ax}+c_2e^{bx}$
(c) $c_1e^{-ax}-c_2e^{-bx}$ (d) $c_1e^{ax}-c_2e^{bx}$

74. To multiply a matrix by scalar K, multiply

(a) Any row by K
(b) Every element by K
(c) Any column by K
(d) Every element by $1/K$

75. If $A = \begin{vmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{vmatrix}$ and $B = \begin{vmatrix} 1 & 2 & 3 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{vmatrix}$. Then the determinant AB has the value

(a) 4 (b) 8
(c) 16 (d) 32

76. The period of a simple pendulum is $T = 2\pi\sqrt{L/g}$. The maximum error in T due to the possible error upto 1% in 'L' and 2.5% in 'g' is

(a) 1.75% (b) 2.5%

(c) 1% (d) 5%

77. The value of $\int_0^{\pi} \sin^2\theta \cdot \cos^4\theta \cdot d\theta$ is

(a) π (b) 2π

(c) $\pi^2/32$ (d) $\pi/16$

78. If $f(x, y) = x^3y - xy^3$, then what is the value of $[1/(df/dx) + 1/(df/dy)]$ $x = 1, y = 2$?

(a) 13/18 (b) −9/18 (c) 9/22 (d) −13/22

79. What is the complete solution for the equation $x(y-z)p + y(z-x)q = z(x-y)$?

(a) $\phi(x + y + z, xyz) = 0$

(b) $\phi(x + 2y + z, xz) = 0$

(c) $\phi(2x + y + z, xyz) = 0$

(d) $\phi(x + y + z, xy) = 0$

80. The solution of $d^2z/dx^2 + z = 0$, given that when $x = 0$, $z = e^y$ and $dz/dx = 1$ is

(a) $Z = \cos x + e^y \sin x$

(b) $Z = \sin x + e^y \cos x$

(c) $Z = \cos x + \sin x$

(d) $Z = e^{2y} \tan x$