

**061/20**

**Question Booklet Alpha Code**

**A**



Question Booklet Sl. No.

**Total Number of Questions : 100**

**Time : 75 Minutes**

**Maximum Marks : 100**

**INSTRUCTIONS TO CANDIDATES**

1. The Question Paper will be given in the form of a Question Booklet. There will be four versions of Question Booklets with Question Booklet Alpha Code viz. **A, B, C & D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the Question Booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a Question Booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your Question Booklet is un-numbered, please get it replaced by new Question Booklet with same alpha code.
6. The Question Booklet will be sealed at the middle of the right margin. Candidate should not open the Question Booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the Question Booklet supplied to him/her contains all the 100 questions in serial order. The Question Booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the Question Booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices **(A), (B), (C) and (D)** having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

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**A**

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1. If  $f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ , then  $f(x + y)$  is  
 A)  $f(x) + f(y)$       B)  $f(x) f(y)$       C) Zero matrix      D) Identity matrix
2. Let  $A$  be a non-singular matrix of order 4. Then  $\det(\text{Adj } A)$  is equal to  
 A)  $|A|$       B)  $|A|^2$       C)  $|A|^3$       D)  $4|A|$
3. The coefficient of  $r^{\text{th}}$  and  $(r + 1)^{\text{th}}$  terms in the expansion of  $(1 + x)^{20}$  are in the ratio  $1 : 2$ , value of  $r$   
 A) 7      B) 6      C) 5      D) 8
4. The value of  $\tan 225^\circ \cot 400^\circ + \tan 675^\circ \cot 315^\circ$   
 A) 2      B) 1      C) -1      D) 0
5. The slope of the line perpendicular to  $x - 3y + 5 = 0$   
 A)  $\frac{1}{3}$       B)  $-\frac{1}{3}$       C) 3      D) -3
6. The function  $f(x) = x^3 - 3x^2 + 4x$   
 A) Strictly increasing in  $(-\infty, \infty)$   
 B) Strictly decreasing in  $(-\infty, \infty)$   
 C) Increasing in  $(-\infty, 0)$ , decreasing in  $[0, \infty)$   
 D) Decreasing in  $(-\infty, 0)$ , increasing in  $[0, \infty)$
7. Derivative of  $\cos^{-1}(\sin x)$  with respect to  $x$   
 A)  $\sin^{-1}(\cos x)$       B)  $x$       C) 1      D) -1
8. The area bounded by the curve  $y = x^3$ , the  $x$ -axis and the ordinates  $x = -2$  and  $x = 1$  is  
 A) 9      B)  $\frac{17}{4}$       C)  $\frac{15}{4}$       D)  $\frac{-15}{4}$
9. The integrating factor of the differential equation  $x \frac{dy}{dx} - y = 2x^2$   
 A)  $e^{-x}$       B)  $e^{-y}$       C)  $\frac{1}{x}$       D)  $x$
10. Integral of  $\frac{1}{\sin^2 x \cos^2 x}$  with respect to  $x$   
 A)  $\tan x - \cot x + c$       B)  $\tan x + \cot x + c$   
 C)  $\tan x \cot x + c$       D)  $\tan x - \cot 2x + c$

11. Low heat cement contains
  - A) Small percentage of aluminium sulphate and high percentage of lime
  - B) Small percentage of lime and gypsum
  - C) High percentage of aluminium sulphate and small percentage of gypsum
  - D) Small percentage of tricalcium aluminate and high percentage of dicalcium silicate
12. For a circular section of masonry having diameter 'd', allowable eccentricity for an axial load is
  - A)  $d/8$
  - B)  $d/6$
  - C)  $d/4$
  - D)  $d/3$
13. The minimum depth of foundation given by Rankine's formula, for a soil of safe bearing capacity of 18 tonnes/sq.m, density 2000 kg/m<sup>3</sup> and angle of repose of soil 30° is
  - A) 1.50 m
  - B) 1.00 m
  - C) 1.20 m
  - D) 1.80 m
14. The length of a line measured with a 20 m chain was found to be 300 m. It was afterwards found that the chain was 0.04 m too long. The true length of the line is
  - A) 300.04 m
  - B) 299.96 m
  - C) 300.60 m
  - D) 300.06 m
15. A line of level was run from bench mark 'A' of reduced level 100.854 to a bench mark 'B' of reduced level 102.652. If the sum of back sights was 2.190 and foresights 0.400, then closing error of levelling work is
  - A) - 0.008 m
  - B) - 3.588 m
  - C) - 0.006 m
  - D) - 0.004 m

16. Which of the following is true for a 4 stroke SI engine with regard to the camshaft speed ?
- A) Same as crankshaft speed
  - B) Half the crankshaft speed
  - C) Three times the crankshaft speed
  - D) Twice the crankshaft speed
17. Which of the following is not an engine part ?
- A) Gudgeon pin
  - B) Camshaft
  - C) Differential
  - D) Manifolds
18. Octane number of a fuel is calculated by comparing the knocking with a mixture of
- A) Iso octane and normal hectane
  - B) Iso octane and normal cetane
  - C) Iso hectane and normal octane
  - D) Iso octane and normal heptane
19. If the torque due to brake load is 200 kNm and the engine speed is 600 rpm, the brake power developed in metric HP is
- A) 25.1 HP
  - B) 22.7 HP
  - C) 17.07 HP
  - D) 8.1 HP
20. Choose the correct combination.
- A) Pelton turbine-High head high discharge, Francis turbine-Low head low discharge
  - B) Pelton turbine-Tangential flow, Francis turbine-Axial flow
  - C) Pelton turbine-High head low discharge, Francis turbine-Medium head medium discharge
  - D) Pelton turbine-Axial flow, Francis turbine-Mixed flow

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21. If the value of power factor in an A.C. circuit is unity. The load is
- A) Inductive
  - B) Capacitive
  - C) Resistive
  - D) Inductive or Capacitive
22. Three resistances of 10 ohms, 15 ohms and 30 ohms are connected in parallel. The total resistance of the circuit is
- A) 5 ohms
  - B) 10 ohms
  - C) 15 ohms
  - D) 20 ohms
23. Magnetic flux has the unit of
- A) Newton
  - B) Ampere turn
  - C) Farad
  - D) Weber
24. An alternating voltage is equal to  $141.4 \sin 377t$ , what is the value of frequency ?
- A) 50 Hz
  - B) 60 Hz
  - C) 70 Hz
  - D) 80 Hz
25. A certain appliance uses 100 W. If it is allowed to run continuously for 12 days, how many kilowatt-hours of energy does it consume ?
- A) 25 KWh
  - B) 26.6 KWh
  - C) 28.8 KWh
  - D) 30 KWh

26. What will be the voltage at the DC terminals of a 3 phase full bridge rectifier fed from a 415 V, 50 Hz supply ?
- A) 260 V
  - B) 360 V
  - C) 460 V
  - D) 560 V
27. Which one of the following material is used for making red colour LED ?
- A) InGaN
  - B) GaP
  - C) GaAsP
  - D) GaN
28. What is the maximum size of memory addressed by an 8 bit address bus in a microcontroller ?
- A) 256 bytes
  - B) 512 bytes
  - C) 64 bytes
  - D) 1024 bytes
29. Which register points to the address of next instruction to be executed ?
- A) Program counter
  - B) Stack pointer
  - C) SFR
  - D) PSW
30. The output voltage of an inverter is controlled by
- A) Frequency
  - B) Amplitude
  - C) Pulse width
  - D) None of the above

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31. The defect in timber indicated by red or yellow tinge caused due to poor ventilation during storage is called  
A) Shakes      B) Callus      C) Burls      D) Foxiness
32. As per IS 1237 : 2012 the average percentage of water absorption in weight of cement concrete flooring tiles shall not exceed  
A) 10      B) 15      C) 20      D) 25
33. The percentage of alumina should contain in a brick is  
A) 60 – 70      B) 75 – 85      C) 20 – 30      D) 50 – 60
34. Pick the not harmful ingredient present in brick earth from the following.  
A) Excess of lime      B) Excess of magnesia  
C) Small quantity of magnesia      D) Excess of silica
35. As per IS 1077 – 1992, the non-modular size of the brick is  
A) 230 mm × 110 mm × 70 mm (length, breadth, height)  
B) 100 mm × 100 mm × 40 mm (length, breadth, height)  
C) 190 mm × 190 mm × 90 mm (length, breadth, height)  
D) 190 mm × 90 mm × 90 mm (length, breadth, height)
36. Fat lime is also called as  
A) Water lime      B) Rich lime      C) Impure lime      D) Lean lime
37. Excess of sulphur present in cement will make cement to  
A) Sound      B) Unsound  
C) Set quickly      D) Weakens the cement
38. Which test is used in cement to detect the presence of uncombined lime ?  
A) Fineness      B) Consistency      C) Soundness      D) Setting time
39. Density of cement is  
A) 1440 kg/m<sup>3</sup>  
B) 1780 kg/m<sup>3</sup>  
C) 2440 kg/m<sup>3</sup>  
D) 914 kg/m<sup>3</sup>
40. The thin layer of sap between sap wood and inner bark in timber is  
A) Outer bark layer      B) Medulla layer  
C) Heart wood layer      D) Cambium layer

41. The alternative name of Potash - lime glass is  
 A) Soft glass      B) Hard glass      C) Flint glass      D) Bottle glass
42. The defect caused by the water vapour which is trapped behind the painted surface  
 A) Grinning      B) Wrinkling      C) Blistering      D) Flashing
43. Which method is not used to estimate bearing capacity of soil ?  
 A) Plate load test  
 B) Penetration test  
 C) Analytical methods by using soil parameters  
 D) Proctor method
44. An enclosure built within or in pairs across, a body of water to allow the enclosed area to be pumped out and creates a dry work environment so that the work can be carried out safely is called  
 A) Cofferdams      B) Caisson      C) Sheet Piles      D) Well Curb
45. A projecting stone which is usually provided to serve as support for joist truss etc. is called  
 A) Corbel      B) Cornice      C) Coping      D) Reveals
46. The edge of a gable, running between eaves and ridge is called  
 A) Valley      B) Verge      C) Ridge      D) Hip
47. The joint used in stairs formed by fitting the entire thickness of the end of one member for a short distance into another piece  
 A) Cogged joint      B) Bridle joint      C) Housed joint      D) Tenon joint
48. The depression or recess made inside the door frame to receive the door shutter is called  
 A) Mullion      B) Rebate      C) Style      D) Horn
49. The paint containing binding material such as polyvinyl lactate, styrene, alkyd resin and other synthetic resins  
 A) Colloidal paints      B) Casein paints  
 C) Emulsion paints      D) Aluminum paints
50. The permissible stress in compression of M30 concrete in bending as per IS 456 -2000 is  
 A) 10 N/mm<sup>2</sup>      B) 15 N/mm<sup>2</sup>      C) 30 N/mm<sup>2</sup>      D) 12 N/mm<sup>2</sup>

51. The best estimate of the time required to accomplish an activity (m) or a path (M), assuming everything proceeds as normal
  - A) Most likely time
  - B) Pessimistic time
  - C) Optimistic time
  - D) Expected time
52. The valve used in pipe lines for convenience in manually closing the pipes to control the flow of water
  - A) Globe valve
  - B) Curb valve
  - C) Ball valve
  - D) Neck valve
53. Damp proof course is measured in
  - A)  $m^2$
  - B)  $m^3$
  - C) m
  - D) none of the above
54. The name of contract where the contractor quotes rates for item work exclusive of the element of materials which are supplied by department free of cost
  - A) Labour contract
  - B) Piece work contract
  - C) Rate contract
  - D) Job contract
55. The start or completion of task, is significant point in project and does not consume time or resources is called
  - A) Event
  - B) Activity
  - C) Network
  - D) Critical path
56. If the observed bearing of a line AB is 142 degrees 18 minutes, find its back bearings
  - A) 52 degrees 18 minutes
  - B) 232 degrees 18 minutes
  - C) 322 degrees 18 minutes
  - D) 217 degrees 42 minutes
57. The bearing of a line AB is 152 degrees 20 minutes and the angle ABC is 124 degrees 38 minutes. What is the bearing of BC ?
  - A) 96 degrees 58 minutes
  - B) 276 degrees 58 minutes
  - C) 332 degrees 20 minutes
  - D) 304 degrees 38 minutes
58. Find the correction for curvature for a distance of 800 m.
  - A) 0.05 m
  - B) 0.8 m
  - C) 0.09 m
  - D) 0.15 m
59. The method of levelling adopted to determine the difference of level between two points at considerable distance apart with great precision
  - A) Trigonometric levelling
  - B) Reciprocal levelling
  - C) Profile levelling
  - D) Fly levelling

60. Find the angle between the lines OA and OB if their respective bearings are 16 degrees 10 minutes and 332 degrees 18 minutes.
- A) 348 degrees 28 minutes      B) 316 degrees 8 minutes  
 C) 406 degrees 8 minutes      D) none of the above
61. Find the delta for a crop if the duty for a base period of 110 days is 1728 hectares / cumec.
- A) 0.55 m      B) 0.55 cm      C) 55 m      D) 5.5 cm
62. The area in which crop is grown at a particular time or crop season is called
- A) Gross Commanded Area      B) Culturable Commanded Area  
 C) Culturable Cultivated Area      D) Culturable Uncultivated Area
63. The impermeable formation which neither containing water nor transmits any water
- A) Aquifuge      B) Aquiclude  
 C) Aquifer      D) None of the above
64. The name of dam constructed to store water during floods and release at a safe rate when the flood recedes
- A) Diversion dam      B) Detention dam  
 C) Storage dam      D) None of the above
65. The spillway which the flow passing over a weir or ogee crest is carried away by the channel running essentially parallel to the crest
- A) Trough spillway      B) Side channel spillway  
 C) Shaft spillway      D) Ogee spillway
66. The structure which raises the water level in the river so that the commanded area can be increased
- A) Diversion head work      B) Spillway  
 C) Cross drainage work      D) Modular outlet
67. “The amount of silt held in suspension is proportional to the upward force of vertical eddies and varies with bed width and some power of the velocity of flow in the channel”
- The above statement is based on which theory ?
- A) Lacey's theory      B) Kennedy's theory  
 C) Khosla's theory      D) Lane's theory

68. The structure constructed transverse to the river flow and extend from the bank into river up to a limit  
A) Groynes B) Storage dam  
C) Diversion head work D) Spillway

69. Find the specific gravity of a fluid having viscosity 0.03 poise and kinematic viscosity 0.015 stokes.  
A) 2.0 B) 2.25 C) 1.5 D) 1.25

70. Find the surface tension in a soap bubble of 30 mm diameter when the inside pressure is 4 N/m<sup>2</sup> above atmospheric pressure.  
A) 0.012 N/m B) 0.03 N/m C) 0.015 N/m D) 0.02 N/m

71. The type of flow which velocity at any given time does not change with respect to space  
A) Steady flow B) Ideal flow  
C) Uniform flow D) Real flow

72. Pick the assumption which is not used in Bernoulli's equation.  
A) Fluid is ideal B) Flow is steady  
C) Flow is compressible D) Flow is irrotational

73. Pick the correct relation used in an orifice.  
A) Coefficient of discharge = Coefficient of velocity × Coefficient of contraction  
B) Coefficient of velocity = Coefficient of discharge × Coefficient of contraction  
C) Coefficient of contraction = Coefficient of velocity × Coefficient of discharge  
D) Coefficient of discharge = Coefficient of velocity / Coefficient of contraction

74. Cipolletti weir is having side slopes as  
A) 1 horizontal to 2 vertical B) 1 horizontal to 3 vertical  
C) 1 horizontal to 4 vertical D) 1 horizontal to 1 vertical

75. The energy correction factor for laminar flow through a circular pipe is  
A) 4/3 B) 2 C) 3 D) 0.5

76. The Reynolds number for a laminar flow is 1600. Find the coefficient of friction between pipe and fluid for that flow.  
A) 0.01 B) 0.02 C) 0.03 D) 0.016

77. The hydraulic machines which convert hydraulic energy into mechanical energy is  
A) Turbines B) Pumps C) Jets D) Siphon

78. The visibility necessary for a driver to be able to see an obstruction in time to bring the vehicle to a halt without a collision is defined as
- A) Stopping sight distance
  - B) Overtaking sight distance
  - C) Intermediate sight distance
  - D) None of the above
79. A soil sample has a porosity of 20 percent. Calculate void ratio.
- A) 0.80
  - B) 1.20
  - C) 0.25
  - D) 0.75
80. The ratio of plasticity index to flow index is defined as
- A) Toughness index
  - B) Consistency index
  - C) Shrinkage index
  - D) Liquidity index
81. Pick the method of removing permanent hardness.
- A) Boiling
  - B) Addition of lime water
  - C) Base exchange process
  - D) None of the above
82. The process of removing suspended matters from the water by keeping it quiescent in tanks, so that the suspended matters may settle down in the bottom due to force of gravity is called
- A) Plain sedimentation
  - B) Aeration
  - C) Filtration
  - D) Lime soda process
83. The type of wastewater treatment process for treating sewage or industrial wastewaters using aeration and a biological floc composed of bacteria and protozoa
- A) Activated sludge process
  - B) Rapid sand filter technique
  - C) Grit chamber process
  - D) Lime soda process
84. The process by which air is circulated through, mixed with or dissolved in a liquid or substance
- A) Aeration
  - B) Sedimentation
  - C) Filtration
  - D) Collection
85. The mass specific gravity of a soil equals 1.35. The specific gravity of solids is 2.70. Determine the void ratio under the assumption that the soil is perfectly dry.
- A) 0.25
  - B) 2.0
  - C) 0.50
  - D) 1.00

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86. Choose the factor which is not affecting compaction.
- A) Type of soil
  - B) Water content
  - C) Addition of admixtures
  - D) None of the above
87. As per IS 2950-1965, the maximum differential settlement should not exceed \_\_\_\_\_ for a raft foundation resting on clayey soils.
- A) 65 mm
  - B) 25 mm
  - C) 40 mm
  - D) 100 mm
88. The diameter of bulb in a under reamed pile may be taken as
- A) 1 to 1.5 times the diameter of the stem
  - B) 2 to 3 times the diameter of the stem
  - C) 3 to 4 times the diameter of the stem
  - D) 4 to 5 times the diameter of the stem
89. The coefficient of consolidation can be determined in laboratory by
- A) Square root of time fitting method
  - B) Unconfined compression method
  - C) California bearing ratio method
  - D) Hydrometer method
90. Pick the method in which water content of soil sample cannot be determined.
- A) Oven drying method
  - B) Sand bath method
  - C) Alcohol method
  - D) None of the above
91. Modulus of rigidity of steel is
- A) 75 GPa – 80 GPa
  - B) 75 MPa – 80 MPa
  - C) 75 KPa – 80 KPa
  - D) 200 – 210 GPa
92. Find the degree of static indeterminacy of propped cantilever.
- A) 2
  - B) 3
  - C) 1
  - D) 0
93. Moment distribution method is used to
- A) Analyze indeterminate structures
  - B) Deflection of structures
  - C) Analyze determinate structures
  - D) None of the above

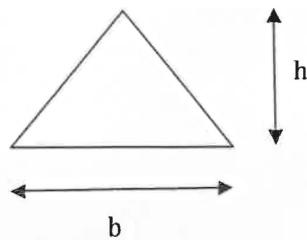
94. Find the slope at the free end of a cantilever with uniform distributed load  $w / m$  for a span "L".

- A)  $wL^4/16 EI$   
 B)  $wL^3/6 EI$   
 C)  $wL^4/8 EI$   
 D)  $wL^3/8 EI$

95. Find the deflection at the free end of a cantilever with span "L" subjected to a clockwise moment "M" at the free end.

- A)  $ML^2/3EI$   
 B)  $ML^2/2EI$   
 C)  $ML^2/4EI$   
 D)  $ML^2/8EI$

96. The moment of inertia of a triangle about its base is given by



- A)  $bh^3/36$   
 B)  $bh^3/18$   
 C)  $bh^3/12$   
 D)  $bh^3/3$

97. The number of days required to remove the prop of a beam having a span of 8 m as per IS 456-2000

- A) 14 days      B) 24 days      C) 21 days      D) 28 days

98. Normally structures exceeding \_\_\_\_\_ in length are designed with one or more expansion joints, as per IS 456-2000.

- A) 35 m      B) 45 m      C) 30 m      D) 40 m

99. Which option is used to find the pitch of lateral tie used in R C C column as per IS 456-2000 ?

- A) 24 times the smallest diameter of the longitudinal bar to be tied  
 B) 24 times the largest diameter of the longitudinal bar to be tied  
 C) 16 times the smallest diameter of the longitudinal bar to be tied  
 D) 16 times the largest diameter of the longitudinal bar to be tied

100. The maximum diameter of reinforcing bars permitted in an R C C slab having overall depth 140 mm, as per IS 456-2000

- A) 8 mm      B) 10 mm      C) 12 mm      D) 16 mm



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**Space for Rough Work**



**A**

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