EJ/EPH/EC/II/25/12

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. : 06545

Series A

TEST BOOKLET

CIVIL ENGINEERING

Time Allowed : 2 Hours | **Full Marks : 100**

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. **Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.**
3. All questions carry equal marks.
   The Answer-Sheet should be submitted to the Invigilator.
   Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.
   Example :
   Suppose the following question is asked :
   The capital of Bangladesh is
   (A) Chennai
   (B) London
   (C) Dhaka
   (D) Dhubri
   You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

   Ⓐ Ⓑ Ⓒ Ⓓ

   In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

   Ⓐ Ⓑ ● Ⓓ

   The example shown above is the only correct method of answering.
4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0·25 per 1 (one) mark against each wrong answer.

SEAL

[No. of Questions : 100]

1. One cubic meter of cement concrete (1 : 2 : 4) is to be mixed by volume. The number of bags required will be approximately

(A) 1

(B) 5

(C) 6

(D) 11

2. The thickness of plastering on wall is generally taken as

(A) 6 mm

(B) 12 mm

(C) 25 mm

(D) 40 mm

3. In long wall and short wall method of estimation, the length of long wall is the centre-to-centre distance between wall and

(A) width of the wall

(B) half-breadth of wall on each side

(C) one-fourth breadth of wall on each side

(D) None of the above

4. A room has dimensions 5 m × 4 m × 3 m. Find the quantity of plastering required for all four walls.

(A) 54 m^2

(B) 60 m^2

(C) 72 m^2

(D) 48 m^2

5. The depreciation cost of a building is calculated based on

(A) age of the building

(B) maintenance cost

(C) original cost and lifespan

(D) market value

6. Salvage value is

(A) the cost of recovery after demolition

(B) the resale value of a building after its lifespan

(C) the market value after its depreciation

(D) None of the above

7. The estimated quantity of cement required in cement mortar (1 : 6) per cubic meter will be

(A) 5·6 bags

(B) 4·8 bags

(C) 8 bags

(D) 3 bags

8. The main objective of water treatment is to

(A) remove hardness only

(B) make water potable and safe for use

(C) make water suitable for industrial use only

(D) reduce colour and odour only

9. Alum is used in water treatment as a

(A) disinfectant

(B) coagulant

(C) softening agent

(D) filtering medium

10. The unit of turbidity is measured in

(A) NTU (Nephelometric Turbidity Unit)

(B) mg/litre

(C) ppm

(D) °dH

11. As per IS 1172–1971, water required per head per day for average domestic purpose is approximately equal to

(A) 25 litres

(B) 75 litres

(C) 135 litres

(D) 350 litres

12. The permissible limit of pH value for drinking water as per BIS is

(A) 5·5 to 6·5

(B) 6·5 to 8·5

(C) 7·5 to 9·0

(D) 8·0 to 10·0

13. The settling velocity of a particle in a sedimentation tank depends on

(A) depth of the tank

(B) surface area of the tank

(C) both depth and surface area of the tank

(D) None of the above

14. In septic tank, the process of digestion is

(A) aerobic

(B) anaerobic

(C) partly aerobic and partly anaerobic

(D) neutral

15. The process of killing pathogenic bacteria of water-borne diseases to make it safe for use in hospital is called

(A) sterilization

(B) aeration

(C) chlorination

(D) disinfection

16. Chlorine is added to drinking water to

(A) remove the suspended particles

(B) remove the colour

(C) disinfect the water

(D) remove the dissolved gases

17. The test period for BOD is

(A) 7 days at 30 °C

(B) 10 days at 20 °C

(C) 4 days at 20 °C

(D) 5 days at 20 °C

18. In sewage analysis, Imhoff cone is used to measure

(A) settleable solids

(B) total solids

(C) organic solids

(D) inorganic solids

19. A trickling is primarily a

(A) straining process to remove suspended solids from sewage

(B) biological oxidation process to remove BOD from sewage

(C) straining process to remove turbidity from water

(D) straining process to remove bacteria from water

20. The main purpose of grit chamber in sewage treatment is to

(A) remove suspended solids

(B) remove coarse inorganic matter like sand and silt

(C) reduce BOD

(D) remove grease and oil

21. Minimum recommended trap seal depth in plumbing fixtures is about

(A) 2 mm

(B) 25 mm

(C) 50 mm

(D) 100 mm

22. A manhole spacing for sewers is usually provided to

(A) allow inspection, cleaning and maintenance

(B) increase velocity

(C) reduce flow rate

(D) carry storm water only

23. The purpose of grease trap in building drainage is to

(A) remove grit and sand only

(B) retain fats, oils and grease to prevent clogging of downstream sewers

(C) disinfect sewage

(D) aerate sewage to increase BOD removal

24. The permissible stress in steel as per working stress method depends on

(A) yield stress of steel

(B) ultimate stress of steel

(C) Young's modulus

(D) both yield and ultimate stresses

25. The principal mode of failure in a long column is

(A) yielding

(B) crushing

(C) buckling

(D) shear

26. Gusset plates are designed to resist

(A) torsion and bending

(B) only shear

(C) shear and bending

(D) shear, bending and torsion

27. In a bolted joint, if bolts are in double shear, the strength of connection is

(A) same as single shear

(B) twice the single shear strength

(C) half the single shear strength

(D) None of the above

28. The reduction factor for slenderness ratio in tension members accounts for

(A) bending

(B) shear tag

(C) buckling of slender elements in compression zones

(D) None of the above

29. A 6 m long simply supported beam has uniform load of 40 kN/m. What is the maximum bending moment?

(A) 120 kN-m

(B) 150 kN-m

(C) 180 kN-m

(D) 240 kN-m

30. A column of 3 m effective length has a slenderness ratio of 120. If $E = 2 \times 10^5$ MPa, find Euler's critical stress.

(A) 13·7 MPa

(B) 22·8 MPa

(C) 28·6 MPa

(D) 36·5 MPa

31. For a 20 mm bolt in a 10 mm thick plate, the pitch should not be less than

(A) 30 mm

(B) 50 mm

(C) 60 mm

(D) 40 mm

32. For a roof truss, the panel length is

(A) total span/number of panels

(B) total height/number of panels

(C) rise × 2

(D) None of the above

33. The main functions of management are

(A) planning, organizing, staffing, directing and controlling

(B) buying, selling and producing

(C) producing, selling and distributing

(D) None of the above

34. Coordinating people and human resources to accomplish organizational goals is the process of

(A) directing

(B) planning

(C) leadership

(D) management

35. The break-even point (BEP) is that level of production where

(A) Total cost = Total revenue

(B) Profit = Total revenue

(C) Fixed cost = Variable cost

(D) None of the above

36. The primary objective of the small-scale industries (SSI) is

(A) export only

(B) profit maximization

(C) employment generation

(D) import substitution

37. The channel of distribution that involves the shorter route is

(A) manufacturer—wholesaler —retailer—customer

(B) manufacturer—retailer —customer

(C) manufacturer—agent —customer

(D) manufacturer—customer

38. A joint-stock company has

(A) no separate legal entity

(B) a separate legal entity distinct from its member

(C) unlimited liability

(D) no continuity

39. SSI refers to industries having

(A) high investment and large production

(B) low investment and limited production

(C) high automation

(D) global operations

40. SWOT analysis is used for

(A) financial auditing

(B) strategic planning and decision-making

(C) production scheduling

(D) inventory control

41. An entrepreneur finds that raw materials are available locally, but skilled labour is not. Which strategy suits an SSI unit best?

(A) Shift the plan to a metro city

(B) Set up training for workers locally

(C) Import finished products

(D) Stop the business plan

42. The Factories Act regulates

(A) employment of contractors

(B) safety, health and welfare of workers

(C) labour union registration

(D) minimum wages

43. A soil has bulk density of 22 kN/m^3 and water content 10%. The dry density of soil is

(A) 18·6 kN/m^3

(B) 20 kN/m^3

(C) 22 kN/m^3

(D) 23·2 kN/m^3

44. The liquid limit of a soil mass is 25% and plastic limit is 10%, then plasticity index of the soil mass is

(A) 35

(B) 10

(C) 15

(D) 20

45. A constant head permeability test is used for

(A) coarse-grained soils

(B) silty soils

(C) clayey soils

(D) organic soils

46. Discharge velocity of a soil is 8×10^{-5} cm/sec and porosity is 0·25. Its seepage velocity will be

(A) 32×10^{-5} cm/sec

(B) $3{\cdot}2 \times 10^{-5}$ cm/sec

(C) $6{\cdot}4 \times 10^{-5}$ cm/sec

(D) 18×10^{-5} cm/sec

47. The shear strength of soil is mainly due to

(A) water content and void ratio

(B) cohesion and angle of internal friction

(C) permeability and compressibility

(D) density and porosity

48. Sheep foot rollers are recommended for compacting

(A) granular soil

(B) cohesive soil

(C) hard rock

(D) any type of soil

49. The angle of friction of purely cohesive soil is

(A) 45°

(B) 30°

(C) 15°

(D) zero

50. The optimum moisture content (OMC) is

(A) the moisture content at which maximum dry density is obtained

(B) the lowest water content

(C) the highest water content

(D) the water content at plastic limit

51. The raft foundation is suitable

(A) when soil is rocky

(B) when loads are light and isolated

(C) when soil bearing capacity is low and loads are heavy

(D) for small structures only

52. Piles driven through soft soil till hard layer is reached are

(A) friction piles

(B) end bearing piles

(C) sheet piles

(D) tension piles

53. The principles of building planning include

(A) aspect, prospect and circulation

(B) colour and decoration

(C) lighting and furniture

(D) only ventilation

54. The reverberation time is the

(A) time taken to produce sound

(B) time taken to transmit light

(C) time taken for sound to reduce to one million of its intensity

(D) time for heat loss

55. Fire resistivity walls and floors are designed to

(A) carry extra loads

(B) provide ventilation

(C) withstand high temperature for a specific period

(D) reduce humidity

56. The Richter scale is used to measure

(A) earthquake intensity

(B) ground acceleration

(C) building displacement

(D) earthquake magnitude

57. To make an RCC structure earthquake resistant, one should

(A) reduce ductility

(B) increase weight

(C) provide proper reinforcement and symmetry

(D) avoid expansion joints

58. In seismic design, ductility of a structure is improved by

(A) using brittle materials

(B) reducing reinforcement

(C) using high-strength steel

(D) providing proper detailing of reinforcement

59. The type of surveying in which the curvature of the earth is taken into account is called

(A) geodetic surveying

(B) plane surveying

(C) preliminary surveying

(D) topographical surveying

60. Out of the following which one is not used to set right angle survey line?

(A) Ranging rod

(B) Cross-staff

(C) Optical square

(D) Prism square

61. The sum of the interior angles of a closed traverse consisting of 10 sides equals to

(A) 360°

(B) 720°

(C) 1080°

(D) 1440°

62. In certain location, contour map is found to be approximately closed contours with decreasing value towards the centre. The location is most likely to be

(A) a ridge

(B) a valley

(C) a depression

(D) a hill

63. Which method or system of plane tabling is suitable when the distance between the point and the instrument station is either too large or cannot be measured accurately due tc some filed conditions?

(A) Intersection

(B) Radiation

(C) Resection

(D) Traversing

64. In linear measurement, the correction for sag is

(A) always additive

(B) always subtractive

(C) always zero

(D) additive for steel tape and subtractive for metallic tape

65. If the quadrantal bearing of a line is S35°W, then whole circle bearing of the line is

(A) 325°

(B) 145°

(C) 215°

(D) 125°

66. If the reduced bearing of a line *AB* is N60°W and length 100 m, then the latitude and departures of the line *AB* will be

(A) +50 m, +86·6 m

(B) +70·7 m, −50 m

(C) +50 m, −86·6 m

(D) +86·6 m, −50 m

67. If the fore bearings of lines *AB* and *BC* are 190° and 39° respectively, then the included angle *ABC* is

(A) 29°

(B) 151°

(C) 49°

(D) 229°

68. If the RL of a BM is 100 m, the back sight is 1·215 m and foresight is 1·87 m, then the RL of forward station is

(A) 99·345 m

(B) 101·215 m

(C) 100·65 m

(D) 101·87 m

69. The purpose of U-fork in plane table surveying is

(A) to transfer the ground point onto drawing sheet

(B) to transfer the ground line onto drawing sheet

(C) to fix magnetic meridian

(D) to fix the table

70. In curve setting out, the chord method is mostly used for

(A) short curves

(B) long curves

(C) spiral curves

(D) vertical curves

71. A tacheometer is primarily used for

(A) levelling only

(B) measuring horizontal distance and vertical elevation

(C) measuring angles only

(D) measuring volume

72. The mix M20 concrete represents the nearest ingredient ratio as

(A) 1 : 3 : 6

(B) 1 : 2 : 4

(C) 1 : 1·5 : 3

(D) 1 : 1 : 2

73. The flexural tensile strength of M25 grade of concrete in N/mm^2 as per IS 456 : 2000 is

(A) 3 N/mm^2

(B) 3·5 N/mm^2

(C) 4 N/mm^2

(D) 4·5 N/mm^2

74. In a singly reinforced beam, steel is provided in

(A) compression zone only

(B) tension zone only

(C) both tension and compression zones

(D) None of the above

75. The purpose of providing stirrups in a reinforced beam is

(A) to resist bending moment

(B) to resist shear

(C) to reduce deflection

(D) to increase span

76. The slenderness ratio for a column is defined as

(A) effective length/least lateral dimension

(B) least lateral dimension/effective length

(C) height/width

(D) None of the above

77. The ratio of shear stress to shear strain is known as

(A) Young's modulus of elasticity

(B) modulus of rigidity

(C) bulk modulus

(D) Poisson's ratio

78. The property of materials by virtue of which it returns to its original dimension during unloading is known as

(A) ductility

(B) malleability

(C) plasticity

(D) None of the above

79. The maximum bending moment in a cantilever beam is found at the

(A) free end

(B) middle

(C) support

(D) None of the above

80. Approximate weight of per meter length of a TMT bar of diameter 16 mm is

(A) 0·88 kg

(B) 1·57 kg

(C) 2·47 kg

(D) None of the above

81. In case of stress-strain curve obtained from tensile test of steel, which one out of the following is typically reached first?

(A) Yield point

(B) Elastic limit

(C) Proportional limit

(D) Ultimate strength

82. A simply supported beam of length 4 m carries uniformly distributed load (udl) of 3 kN/m on its entire length. The value of shear force (either positive or negative) at its centre will be

(A) 0 kN

(B) 3 kN

(C) 6 kN

(D) 12 kN

83. The soil transported by flowing water and deposited in lakes is called

(A) lacustrine soil

(B) alluvial soil

(C) marine soil

(D) loess soil

84. For determination of liquid limit in laboratory, the required air dried soil sample to be taken for determination of liquid is obtained by passing

(A) 75 micron sieve

(B) 300 micron sieve

(C) 425 micron sieve

(D) 4·75 mm sieve

85. The field density of fine grained soil is determined by

(A) Proctor needle test

(B) cylindrical method

(C) core cutter method

(D) pycnometer method

86. If the isolated spread footings of two columns are connected by a beam, then it is called as

(A) strap footing

(B) combined footing

(C) continuous footing

(D) spread footing

87. In water treatment plant, the aeration is done by

(A) adding oxygen

(B) spray nozzles

(C) coagulation

(D) chlorination

88. As per IS : 456–2000, the diameter of bars used in column as longitudinal bars shall not be less than

(A) 8 mm

(B) 10 mm

(C) 12 mm

(D) 16 mm

89. As per IS : 456–2000, minimum clear cover in footing is to be provided as

(A) 30 mm

(B) 40 mm

(C) 50 mm

(D) 60 mm

90. As per IS : 456–2000, maximum area of tension reinforcement shall not exceed (where b is the width and D is the overall depth of the beam)

(A) $0{\cdot}04bD$

(B) $0{\cdot}06bD$

(C) $0{\cdot}02bD$

(D) $1{\cdot}2bD$

91. A common alternative material for reducing the cost of construction is

(A) high-grade cement

(B) stabilized soil block

(C) marble tiles

(D) prestressed concrete block

92. The most suitable type of toilet in rural areas with no sewer system is

(A) flush toilet

(B) septic tank

(C) pit latrine

(D) composting toilet

93. Which one is a lightweight low-cost material?

(A) Stone

(B) Aerated concrete block

(C) RCC

(D) Burnt clay brick

94. Construction management primarily aims at

(A) reducing cost and time

(B) improving aesthetics

(C) increasing project cost

(D) reducing labour

95. Float in CPM is

(A) extra time available

(B) extra cost

(C) extra labour

(D) safety margin only

96. The direct cost in construction includes

(A) labour, material, equipment

(B) office rent

(C) insurance

(D) contingency

97. The bearing in bridge transfers load

(A) from superstructure to sub-structure

(B) from abutment to deck

(C) from foundation to deck

(D) None of the above

98. The abutment of a bridge serves as

(A) intermediate support

(B) end support to the bridge deck

(C) load distribution member

(D) None of the above

99. The minimum carriageway width of a double-lane bridge is

(A) 3·75 m

(B) 7·5 m

(C) 10·5 m

(D) None of the above

100. In geotechnical engineering, N-values are obtained from which of the following field tests?

(A) CBR test

(B) Plate load test

(C) Pile load test

(D) SPT test

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