SEAL

Booklet Series

A

05/EFC/M-2025-03(A)

Question Booklet

CIVIL ENGINEERING

PAPER – II

Booklet Serial No.
1604633

Candidate's Roll Number

Time Allowed : 2 Hours

Maximum Marks : 300

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

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **100** questions in all.
2. **All** questions carry equal marks.
3. An Answer Sheet has been supplied inside the question booklet to mark the answers. **You must write your Roll Number and encode it and write other particulars in the space provided in the Answer Sheet, failing which your Answer Sheet will not be evaluated.**
4. **Immediately after commencement of the examination, you should check up your Question Booklet and attached answer sheet and ensure that the Question Booklet Series is printed on the top left-hand corner of the Booklet and the series encoded in answer sheet are same. Also please check that the Booklet contains 20 printed pages including two pages (Page Nos. 19 and 20) for Rough Work and no page or question is missing or unprinted or torn or repeated or question booklet and answer sheet have different series. If you find any defect in this Booklet and attached answer sheet, get it replaced immediately by a complete Booklet with OMR sheet of the same series.**
5. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
6. Questions and their responses are printed in English version in this Booklet. Each question comprises of **four** responses – (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark it in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case choose ONLY ONE response for each question.
7. In the Answer Sheet, there are **four** circles – (A), (B), (C) and (D) against each question. To answer the questions, you are to mark with **Black/Blue ink ballpoint pen ONLY ONE circle** of your choice for each question. Select only one response for each question and mark it in your Answer Sheet. If you mark more than one circle for one question, the answer will be treated as wrong. **Use Black/Blue ink ballpoint pen only to mark the answer in the Answer Sheet. Any erasure or change is not allowed.**
8. For each question for which a wrong answer/more than one answer has been given by the candidates, **one third (1/3)** of the marks assigned to that question will be deducted as penalty.
9. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. **After the examination has concluded, you must hand over your Answer Sheet to the Invigilator.** Thereafter, you are permitted to take away the Question Booklet with you.
10. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
11. Candidates must assure before leaving the Examination Hall that their Answer Sheets will be kept in Self Adhesive LDPE Bag and completely packed/sealed in their presence.

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1. What is a characteristic of a coplanar parallel force system?

(A) Forces act in different planes and are parallel

(B) Forces act in the same plane but are not parallel

(C) Forces act in different planes and are not parallel

(D) Forces act in the same plane and are parallel

2. A simple spring mass vibrating system has a natural frequency of f_n. If the spring stiffness is halved and mass is double, then the natural frequency will become

(A) $f_n/2$

(B) $2f_n$

(C) $4f_n$

(D) $8f_n$

3. Which of the following phenomena occurs due to shear strains modifying bending stresses in the flange and causes the sections to warp?

(A) Local buckling

(B) Web crippling

(C) Shear lag

(D) Torsional instability

4. A tensile test was conducted on a steel bar. The gauge length of the bar was 10 cm and the extension was 2 mm. What will be the percentage elongation?

(A) 0.002

(B) 0.02

(C) 0.2

(D) 2

5. The strength of beams depend merely on

(A) Modulus section

(B) Moment of inertia

(C) Flexural rigidity

(D) Moment of resistance

6. Example of cantilever beam is

(A) Portico slabs

(B) Roof slab

(C) Bridges

(D) Railway sleepers

7. In Rectangular section, if average Shear stress is 20 N/mm^2, then the maximum shear stress is

(A) 15 N/mm^2

(B) 20 N/mm^2

(C) 30 N/mm^2

(D) 150 N/mm^2

8. A moment 'K' required to rotate near end of a prismatic beam through a unit angle without translation, the far end being freely supported is given by:

(A) 3EI/L

(B) 4EI/L

(C) EI/L

(D) L/EI

9. The ratio of the deflections of the free end of a cantilever due to an isolated load at 1/3rd and 2/3rd of the span is

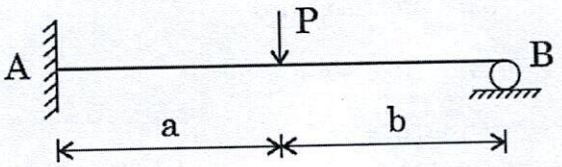
(A) 1/7

(B) 2/7

(C) 3/7

(D) 2/5

10. Fixed end moment of a propped cantilever due to a concentrated load P at a distance 'a' from



Fixed ends as shown in figure is given by

(A) $\frac{Pab(L+b)}{2L^2}$

(B) $\frac{Pab(L+b)}{L^2}$

(C) $\frac{-Pab(L+b)}{2L^2}$

(D) $\frac{-Pab(L+b)}{L^2}$

11. A beam of span 5 m, fixed at A and B, carries a point load of 50 kN at 2 m from 'A'. The fixed end moments at the supports 'A' and 'B', respectively, are;

(A) 24 kNm clockwise and 36 kNm clockwise

(B) 24 kNm anticlockwise and 36 kNm anticlockwise

(C) 36 kNm clockwise and 24 kNm anticlockwise

(D) 36 kNm anticlockwise and 24 kNm clockwise

12. A UDL of kN/m of length 5 m is moving from left to right support on a simply supported beam of span 10 m. The maximum bending moment at 4 m from the left support is:

(A) 70 kN-m

(B) 90 kN-m

(C) 50 kN-m

(D) 30 kN-m

13. A steel bar (E = 200 GPa, $\alpha = 12 \times 10^{-6}/°C$) expands by 0.3 mm due to a temperature increase. If the original length of the bar was 15 cm, what was the temperature rise?

(A) 166.6°C

(B) 100°C

(C) 180°C

(D) 120.6°C

14. A mild steel wire 5 mm in diameter and 1 m long. If the wire is subjected to an axial tensile load of 10 kN, what will be its extension?

(A) 3.15 mm

(B) 2.55 mm

(C) 2.65 mm

(D) 2.45 mm

15. What happens to the critical buckling pressure of a thin cylinder vessel when subjected to internal fluid pressure and torque?

(A) Increases due to the additional torsional stress

(B) Decreases due to the additional radial stress

(C) Doubles due to the combined effects of pressure and torque

(D) Remains unaffected by the presence of torque

16. For a heavily reinforced concrete member, the nominal maximum size of the aggregates should be restricted to

(A) 5 mm less than the minimum clear distance between the main bars

(B) 5 mm less than the minimum cover to the reinforcement

(C) Smaller of (A) and (B)

(D) Greater of (A) and (B)

17. A simply supported beam deflects by 5 mm when it is subjected to a concentrated load of 10 kN at its centre. What will be deflection in a 1/10 model of the beam if the model is subjected to a 1 kN load at its centre?

(A) 5 mm

(B) 0.5 mm

(C) 0.05 mm

(D) 0.005 mm

18. Which chemical is used as a soil treatment in termite proofing?

(A) Chlorine

(B) Bromine

(C) Aldrin

(D) Potassium hydroxide

19. A contractor agreed to build 30 temporary sheds in 90 days at a price of Rs.10,000/unit. Twenty days later, the contractor has finished 8 sheds with an actual total cost of Rs.85,000. What is the status of the project?

(A) The project is time and cost over run

(B) The project is time over run and cost under run

(C) The project is time under run and cost over run

(D) The project is time and cost under run

20. Which of the following is provided on the horizontal shores when one building is higher than the other?

(A) Flying shore

(B) Pile Underpinning

(C) Pit Underpinning

(D) Raking shore

21. The main reinforcement of an RC slab consists of 10 mm bars at 10 cm spacing. If it is desired to replace 10 mm bars by 12 mm bars, then the spacing of 12 mm bars should be

(A) 10 cm

(B) 12 cm

(C) 14.40 cm

(D) 16 cm

22. In mix design for M 25 concrete, the assumed standard deviation for estimation of target mean strength of concrete mix, as recommended by IS 456 : 2000 is (in N/mm^2):

(A) 4.5

(B) 4.0

(C) 5.0

(D) 3.5

23. Which of the following is not an assumption for working stress design method?

(A) Concrete is elastic

(B) A section which is plane before bending remains plane after bending

(C) Tensile strength of concrete is considered

(D) Bond between steel and concrete is perfect within the elastic limit of steel

24. For concreting of heavily reinforced sections without vibration, the workability of concrete expressed as compacting factor should be

(A) 0.75 - 0.80

(B) 0.80 - 0.85

(C) 0.85 - 0.92

(D) Above 0.92

25. The temperature reinforcement in the vertical slab of a T-shaped R.C. retaining wall is

(A) Not needed

(B) Provided equally on inner and front faces

(C) Provided more on inner face than on front face

(D) Provided more on front face than on inner face

26. The plastic modulus of a section is 5×10^{-4} m^3. Its shape factor is 1.2 and the plastic moment capacity is 120 kNm, what is the value of the yield stress of the material?

(A) 100 N/mm^2

(B) 200 N/mm^2

(C) 240 N/mm^2

(D) 288 N/mm^2

27. Select the incorrect statement from the following.

(A) Purlin is subjected to biaxial bending

(B) The span of purlin is center to center of truss; purlin is located at the panel point of the truss.

(C) Purlin runs perpendicular to truss

(D) Purlin is designed as a tension member

28. When the effect of wind or earthquake load is taken into account, the permissible stress as specified in rivets may be increased by

(A) 33.33%

(B) 50%

(C) 10%

(D) 25%

29. Which of the following is true regarding plastic design methods?

(A) moments produced by different loading conditions can be added together

(B) lateral bracing requirements are less stringent than for elastic design

(C) difficult to design for fatigue

(D) more saving in column design

30. In a gusseted base, when the end of the column is machined for complete bearing on the base plate, then the axial load is assumed to be transferred to base plate

(A) Fully by direct bearing

(B) Fully through fastenings

(C) 50% by direct bearing and 50% through fastenings

(D) 75% by direct bearing and 25% through fastenings

31. Which of the following are used as a standard sedimentation method in a laboratory?

(A) Sand replacement method

(B) Pipette method

(C) Hydrometer method

(D) Sedimentation analysis method

32. For determining the ultimate bearing capacity of soil, the recommended size of a square bearing plate to be used in load plate test should be 30 to 75 cm square with a minimum thickness of

(A) 5 mm

(B) 10 mm

(C) 15 mm

(D) 25 mm

33. The weight of a pycnometer containing 400 g sand and water full to the top is 2150 g. The weight of pycnometer full of clean water is 1950 g. If specific gravity of the soil is 2.5, the water content is

(A) 5%

(B) 10%

(C) 15%

(D) 20%

34. The value of factor of safety used, for finding safe bearing capacity is

(A) 2.5

(B) 2

(C) 4

(D) 3

35. The immediate settlement can be computed from the expression, based on

(A) Pressure distribution

(B) Theory of plasticity

(C) Theory of elasticity

(D) Terzaghi's analysis

36. The influence factor for rigid square footing is

(A) 0.88

(B) 0.82

(C) 1.06

(D) 1.70

37. In a liquid limit test, the moisture content at 10 blows was 70% and that at 100 blows was 20%. The liquid limit of the soil, is

(A) 35%

(B) 50%

(C) 65%

(D) 70%

38. Pile foundations are generally preferred to for

(A) bridge foundations

(B) sky scrapper buildings

(C) residential buildings

(D) runways

39. The angle of internal friction of clays, is usually

(A) 0° to 5°

(B) 5°to 20°

(C) 20° to 30°

(D) 30° to 45°

40. A failure wedge develops if a retaining wall

(A) moves away from the backfill

(B) moves towards the backfill

(C) sinks downwards

(D) stresses equally by vertical and horizontal forces

41. If there is no impervious boundary at the bottom of a hydraulic structure, stream lines tend to follow a:

(A) straight line

(B) parabola

(C) semi-ellipse

(D) semi-circle

42. The length/diameter ratio of cylindrical specimens used in triaxial test, is generally

(A) 1

(B) 1.5

(C) 2

(D) 2.5

43. Skempton's pore pressure coefficient B for saturated soil is

(A) 1

(B) zero

(C) between 0 and 1

(D) greater than 1

44. The foundation that is used when the soil mass is sufficiently erratic?

(A) Strap footing

(B) Combined footing

(C) Mat footing

(D) Rectangular combined footing

45. If a maximum settlement of 50 mm is permitted for a raft, the differential settlement must not exceed

(A) 30 mm

(B) 10 mm

(C) 20 mm

(D) 25 mm

46. Auger boring is used in which type of soil

(A) Cohesion less soil

(B) Cohesive soil

(C) Coarse-grained soil

(D) Pervious soil

47. In friction circle method of slope stability analysis, if r defines the radius of the slip circle, the radius of friction circle is:

(A) $r\sin\varphi$

(B) r

(C) $r\cos\varphi$

(D) $r\tan\varphi$

48. An infinite slope is to be constructed in a soil. The effective stress strength parameters of the soil are $c'=0$ and $\phi'=30$. The saturated unit weight of the slope is 20 kN/m^3 and the unit weight of water is 10 kN/m^3. Assuming that seepage is occurring parallel to the slope, the maximum slope angle for a factor of safety of 1.5 would be

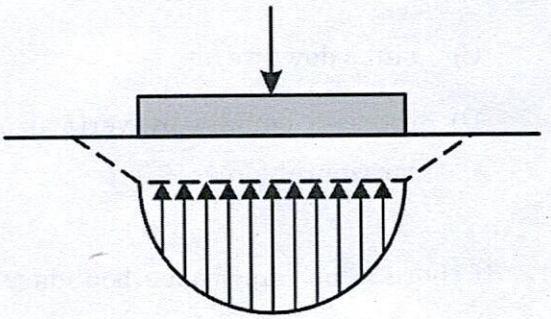
(A) 10.89°

(B) 11.30°

(C) 12.48°

(D) 14.73°

49. The contact pressure and settlement distribution for a footing are shown in the figure.



The figure corresponds to a

(A) rigid footing on granular soil

(B) flexible footing on granular soil

(C) flexible footing on saturated clay

(D) rigid footing on cohesive soil

50. The width of a square footing and the diameter of a circular footing are equal. If both the footings are placed on the surface of sandy soil, the ratio of the ultimate bearing capacity of circular footing to that of square footing will be

(A) 4/3

(B) 1

(C) 3/4

(D) 2/3

51. Priming of a pump refers to

(A) removing air from the pump casing and suction line

(B) lubricating the pump bearings

(C) increasing the rotational speed of the pump

(D) adjusting the impeller clearance

52. One challenge associated with double volute casings is

(A) increased complexity in manufacturing and alignment

(B) higher risk of leakage due to multiple seams

(C) decreased efficiency in converting kinetic to pressure energy

(D) reduced flow rates

53. Which of the following is used for the friction factor of circular pipes?

(A) Re/64

(B) 16/Re

(C) 64/Re

(D) Re/16

54. The piezometric head in a static liquid:

(A) remains constant only in a horizontal plane

(B) remains constant at all points in the liquid

(C) decreases linearly with depth below a free surface

(D) increases linearly with depth below a free surface

55. Flow occurring in a pipeline when a valve is being opened is

(A) steady

(B) unsteady

(C) laminar

(D) vortex

56. For a body floating in a liquid the normal pressure exerted by the liquid acts at

(A) bottom surface of the body

(B) C.G. of the body

(C) metacentre

(D) all points on the surface of the body

57. The stress-strain relation of the Newtonian fluid is :

(A) linear

(B) parabolic

(C) hyperbolic

(D) inverse type

58. When rainfall intensity is greater than infiltration capacity indicated by the infiltration capacity curve, the excess water contributes to :

(A) ground water recharge

(B) evaporation

(C) evapotranspiration

(D) surface runoff

59. Which of the following is a method used to estimate potential evapotranspiration?

(A) Hazen-Williams equation

(B) Manning's equation

(C) Chezy's equation

(D) Thornthwaite equation

60. In a flow-mass curve study, the demand line draw from a ridge does not intersect the mass curve again. This implies that the

(A) reservoir is not full at the beginning

(B) storage is not adequate

(C) demand cannot be met by the inflow as the reservior will not refill

(D) reservoir is wasting water by spill

61. Storage coefficient of a compressible confined aquifer is a function of

(A) transmissibility of aquifer and specific yield of aquifer.

(B) transmissibility of the aquifer and compressibility of water.

(C) permeability, thickness and compressibility of aquifer and compressibility of water

(D) specific weight of water, thickness of the aquifer, compressibility of the aquifer and that of water

62. Irrigation project is classified as a major project when the CCA involved in the project is more than _____

(A) 2500 hectares

(B) 10000 hectares

(C) 2000 hectares

(D) 5000 hectares

63. When a canal is carried over a natural drainage, the structure provided, is known as

(A) syphon

(B) aqueduct

(C) super passage

(D) syphon-aqueduct

64. Temporary spurs are also called

(A) Weirs

(B) Canals

(C) Bunds

(D) Barrages

65. Which method of irrigation is useful for sandy soils and shallow lands where land levelling is not possible?

(A) Sub-surface irrigation

(B) Drip irrigation

(C) Sprinkler irrigation

(D) Surface irrigation

66. _____ is a secondary pollutant causing pollution of air.

(A) Formaldehyde

(B) Oxides of sulphur

(C) Carbon monoxide

(D) Hydrocarbons

67. Zero hardness of water is achieved by

(A) using lime soda process

(B) excess lime treatment

(C) ion exchange method

(D) using excess alum dosage

68. Sewage treatment units are designed for

(A) maximum flow only

(B) minimum flow only

(C) average flow only

(D) maximum and minimum flow

69. Which of the following chemical compounds can be used for de-chlorination of water?

(A) Carbon dioxide

(B) Bleaching powder

(C) Sulphur dioxide

(D) Chloramines

70. Which of the following device is used to prevent the clogging of sewer pipes?

(A) Drop manhole

(B) Storm regulators

(C) Flushing tank

(D) Lamp hole

71. Which of the following air pollution control device has maximum efficiency?

(A) Spray tower

(B) Wet cyclonic scrubber

(C) Dynamic precipitator

(D) Electrostatic precipitator

72. Which process of water treatment is done to avoid floating debris, branches, trees, or other large particles suspended in water?

(A) Primary sedimentation

(B) Secondary sedimentation

(C) Screening

(D) Aeration

73. The disposal method in which solid waste is heated in an oxygen free atmosphere and reduced to gaseous, liquid and solid fractions :

(A) Pyrolysis

(B) Pulverisation

(C) Incineration

(D) Composting

74. The two main gases liberated from an anaerobic sludge digestion tank would include

(A) Carbon dioxide and methane

(B) Ammonia and carbon dioxide

(C) Ammonia and methane

(D) Ammonia and hydrogen sulphide

75. Which of the following pairs is not correctly matched?

(A) COD – Biodegradability of waste water

(B) BOD – Strength of waste

(C) Nitrate – Methanoglobinemia

(D) Methane – Product of anaerobic decomposition

76. The process of burning of municipal solid waste at high temperature is called

(A) Incineration

(B) Composting

(C) Land filing

(D) Shredding

77. _____ is a liquid that passes through solid waste and extracts suspended impurities from it.

(A) Leachate

(B) Sludge

(C) Distilled water

(D) Municipal waste

78. Why is it difficult to recycle plastics?

(A) It is very hard

(B) It comes in different sizes

(C) It is adhesive

(D) It contains different types of polymer resins

79. The organic material of the solid waste will decompose

(A) By the flow of water

(B) By the soil particles

(C) By the action of microorganisms

(D) By oxidation

80. Which of the following is not a primary air pollutant?

(A) CO

(B) NO

(C) O_3

(D) SO_2

81. Which of the following type of pavement marking is meant to separate the opposite streams of traffic on undivided two-way roads?

(A) Turn markings

(B) No passing zone markings

(C) Centre lines

(D) Stop lines

82. Which of the following does not include in the phases of highway planning?

(A) Financing

(B) Showing the phasing of a plan in the five-year plan

(C) Assessment of road length requirement

(D) Preparation of master plan

83. Which of the following pavement is better for highway lighting?

(A) Gravel roads

(B) WBM

(C) Black top surface

(D) Cement concrete

84. Extra widening of pavements provided because of off tracking is known as :

(A) Mechanical widening

(B) Psychological widening

(C) Frictional widening

(D) Physical widening

85. The permissible cant deficiency for speed of upto 100 kph on a Narrow Gauge track is

(A) 3.8 mm

(B) 3.8 cm

(C) 5.1 mm

(D) 5.1 cm

86. As per ICAO recommendation, minimum width of run way end safety area (RESA) for instrumental runway should be

(A) 150

(B) 300

(C) 250

(D) 500

87. To cope up high temperature of 196°C, the taxi ways and aprons are constructed with

(A) Asphaltic concrete

(B) Rubberised tar concrete

(C) Plain concrete

(D) All the above

88. The provision of traffic signals at intersections

(A) reduces right angled and rear end collisions

(B) increases right angled and rear end collisions

(C) reduces right angled collisions but may increase rear end collisions

(D) reduces rear end collisions but may increase right angled collisions

89. In which of the following operations more than half the lanes are allotted for one direction during peak hours?

(A) One-way streets

(B) Tidal flow operations

(C) Restricting right turn

(D) None of the above

90. The surface of the highway pavement should be designed to allow

(A) High rolling resistance

(B) Low rolling resistance

(C) No rolling resistance

(D) Very high rolling resistance

91. The maximum length of vehicle that can be used on Indian roads is

(A) 11

(B) 12

(C) 13

(D) 14

92. The design period of cement concrete road is taken as

(A) 20

(B) 25

(C) 30

(D) 35

93. Design of horizontal and vertical alignments, super-elevation, sight distance and grades, is worst affected by

(A) width of the vehicle

(B) length of the vehicle

(C) height of the vehicle

(D) speed of the vehicle

94. Why is proper drainage essential for sub-grade soil in highway pavements?

(A) To prevent moisture retention and strength reduction

(B) To reduce erosion

(C) To increase soil temperature

(D) To allow easy mixing with cement

95. _____ is a parabolic device that is less aggressive than speed bump.

(A) Speed cushion

(B) Speed dip

(C) Speed hump

(D) Speed table

96. While taking Observations for the height and distances, which of the following method of surveying is used?

(A) Plane surveying

(B) Geodic surveying

(C) Chain surveying

(D) Compass surveying

97. Cross staff is an instrument used for

(A) measuring approximate horizontal angles

(B) setting out right angles

(C) measuring bearings of the lines

(D) none of the above

98. The process of turning the telescope about the vertical axis in horizontal plane is known as

(A) transiting

(B) reversing

(C) plunging

(D) swinging

99. The horizontal angle between the true meridian and magnetic meridian at a place is called

(A) Azimuth

(B) Declination

(C) Local attraction

(D) Magnetic bearing

100. The combination of different approaches to validate information, strategies and results in a research study is technically known as

(A) Meta-analysis

(B) Triangulation

(C) Trend analysis

(D) Cross validation