28/AE/CME/M–2022–6

Booklet Series

Candidate's Roll Number

A

Serial No. 100113

Question Booklet

Paper—VI

CIVIL ENGINEERING

Time Allowed : 1 Hour | **(Objective)** | **Maximum Marks : 100**

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

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **50** questions in all.
2. **All** questions carry equal marks.
3. Attempt **all** questions.
4. **Immediately after commencement of the examination, you should check up your Question Booklet and ensure that the Question Booklet Series is printed on the top right-hand corner of the Booklet. The Booklet contains 8 printed pages and no page or question is missing or unprinted or torn or repeated. If you find any defect in this Booklet, get it replaced immediately by a complete Booklet 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. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. **You must write your Name, Roll No. and other particulars on the first page of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated.**
7. You will encode your **Roll Number** and the **Question Booklet Series A, B, C or D** as it is printed on the top right-hand corner of this Question Booklet with Black/Blue ballpoint pen in the space provided on **Page–2** of your Answer Sheet. **If you do not encode or fail to encode the correct series of your Question Booklet, your Answer Sheet will not be evaluated correctly.**
8. Questions and their responses are printed in English only in this Booklet. Each question comprises **four** responses—(A), (B), (C) and (D). You are to select ONLY ONE correct response and mark 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. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
9. In the Answer Sheet, there are **four** brackets—(A), (B), (C) and (D) against each question. To answer the questions you are to **mark with Black/Blue ballpoint pen** ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. **Any erasure or change is not allowed.**
10. 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.
11. 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.

SEAL

1. Consumptive use of water by a crop means water consumed by

(A) evaporation only

(B) conveyance loss and evaporation

(C) transportation and conveyance loss

(D) evaporation and transpiration

2. The GCA of an irrigation canal is 50000 hectares out of which 80% is CCA. If the intensity of irrigation for Rabi season is 60% and for Kharif season is 20%, then the crop ratio will be

(A) 1·33

(B) 3

(C) 4

(D) 0·33

3. Out of 120 cm of water pumped into a canal, 80 cu m of water could be supplied to a field. 60 cu m of water was stored in the root zone while water required in root zone prior to irrigation was 80 cu m. The storage efficiency of irrigation is

(A) 75%

(B) 66·67%

(C) 100%

(D) 50%

4. The depth of root zone for a particular crop is 100 cm. If the dry unit weight of soil is 2·0 gm/cc of the field and its field capacity and permanent wilting point being 20% and 10% respectively, then the maximum storage capacity of irrigation water in cm will be

(A) 10

(B) 20

(C) 30

(D) 50

5. The duty is largest

(A) on the field

(B) at the head of watercourse

(C) at the head of a main canal

(D) Same at all places

6. An artesian aquifer is the one where

(A) water surface under the ground is at atmospheric pressure

(B) water table serves as upper surface of zone of saturation

(C) water is under pressure between two impervious strata

(D) None of the above

7. For a discharge of 100 cumec to flow at a depth 5·0 m in a rectangular horizontal channel, the width as per Lacey's theory should be

(A) 47·5 m

(B) 37·5 m

(C) 20 m

(D) 10 m

8. If the specific yield of a particular sand is 30% and its porosity is 50%, then the specific retention of the sand will be
   (A) 80%
   (B) 55%
   (C) 40%
   (D) 20%

9. According to Lacey's theory, the silt supporting eddies are generated from
   (A) sides of channel only
   (B) bottom of channel only
   (C) sides as well as bottom of channel
   (D) None of the above

10. Garret's diagram is based on
   (A) Kennedy's theory
   (B) Lacey's theory
   (C) Khosla's theory
   (D) None of the above

11. If a stream is carrying a discharge of 4·0 cumec per meter width having a silt factor 2·0, then the Lacey's scour depth will be
   (A) 1·35 m
   (B) 2·7 m
   (C) 5·4 m
   (D) 10·8 m

12. Trap efficiency of reservoir is a function of
   (A) capacity/outflow ratio
   (B) capacity/inflow ratio
   (C) outflow/inflow ratio
   (D) None of the above

13. When the reservoir is full, the maximum compressive force in a gravity dam is produced
   (A) at the toe
   (B) at the heel
   (C) within the middle third of base
   (D) at the centre of base

14. The elementary profile of a dam is
   (A) a rectangle
   (B) a trapezoid
   (C) an equilateral triangle
   (D) a right-angled triangle

15. A river training work is generally required when the river is
   (A) aggrading type
   (B) degrading type
   (C) meandering type
   (D) both aggrading type and degrading type

16. The maximum permissible eccentricity for no tension at the base of a gravity dam is
   (A) $B/2$
   (B) $B/3$
   (C) $B/4$
   (D) $B/6$

17. A hyetograph is a graphical representation of
   (A) rainfall intensity and time
   (B) rainfall depth and time
   (C) discharge and time
   (D) cumulative rainfall and time

18. A mass curve of rainfall is a plot of
(A) the maximum intensity of rainfall against time
(B) the intensity of rainfall against time
(C) the accumulated precipitation against time
(D) None of the above

19. The relationship between Manning's coefficient and Chezy's coefficient is given by
(A) $C = \frac{1}{n}R^{1/3}$
(B) $C = \frac{1}{n}R^{1/4}$
(C) $C = \frac{1}{n}R^{1/6}$
(D) $C = \frac{1}{n}R^{2/3}$

20. In a rectangular channel, the alternate depths are 1·5 m and 2·5 m respectively. The specific energy head (in meter) is
(A) 4·48
(B) 3·35
(C) 3·26
(D) 3·06

21. A rectangular channel has a bottom width of 2 m and longitudinal slope of the channel is 0·0003. What will be the average shear stress on the channel boundary when the flow takes place at a uniform depth of 1·25 m? (Take $\gamma = 10\ kN/m^3$)
(A) 16·66 N/m²
(B) 10·66 N/m²
(C) 2·66 N/m²
(D) 1·66 N/m²

22. In a triangular channel having a side slope of 2 horizontal : 1 vertical, the Froude number is given by
(A) $v/\sqrt{gy}$
(B) $v/\sqrt{2gy}$
(C) $v/\sqrt{gy/2}$
(D) $2v/\sqrt{gy}$

23. For a given specific energy E, the critical depth y_c for a rectangular channel is given by
(A) $y_c = \frac{3}{2}E$
(B) $y_c = \frac{2}{3}E$
(C) $y_c = \frac{4}{5}E$
(D) $y_c = \frac{3}{4}E$

24. A 3·0 m wide rectangular channel flowing at its normal depth of 0·8 m carries a discharge of 9·5 cumec. The bed slope of the channel is
(A) mild
(B) steep
(C) critical
(D) adverse

25. In deriving the equation for the hydraulic jump in a rectangular channel in terms of conjugate depths and initial Froude number

(A) energy and continuity equations are used

(B) only continuity equation is used

(C) continuity and momentum equations are used

(D) energy, momentum and continuity equations are used

26. A stationary hydraulic jump occurs in a rectangular channel with initial and sequent depth being equal to 0·40 m and 1·60 m respectively. Calculate initial Froude number and energy loss.

(A) $\sqrt{10}$ and $\frac{15}{32}$

(B) $\sqrt{9}$ and $\frac{16}{33}$

(C) $\sqrt{7}$ and $\frac{17}{35}$

(D) $\sqrt{6}$ and $\frac{19}{37}$

27. As per IRC recommendation, the maximum limit of super-elevation for mixed traffic in plain terrain is

(A) equal to camber

(B) 1 in 15

(C) 1 in 12·5

(D) 1 in 10

28. The transition curve used in the horizontal alignment of highways as per IRC recommendation is

(A) spiral

(B) cubic parabola

(C) lemniscate

(D) hyperbola

29. The value of ruling gradient in plains as per IRC recommendation is

(A) 1 in 15

(B) 1 in 20

(C) 1 in 30

(D) 1 in 40

30. For the design of superelevation for mixed traffic conditions, the speed is reduced by

(A) 25%

(B) 35%

(C) 45%

(D) 55%

31. Highway facilities are designed for

(A) annual average daily traffic

(B) annual average hourly traffic

(C) peak hour volume of the year

(D) thirtieth highest volume of the year

32. An enoscope is used for measuring

(A) overall speed

(B) running speed

(C) spot speed

(D) time-mean speed

33. The maximum width of a vehicle as recommended by IRC is

(A) 2·44 m

(B) 2·75 m

(C) 3·0 m

(D) 3·41 m

34. Desire lines are plotted in

(A) traffic volume studies

(B) origin and destination studies

(C) speed studies

(D) accident studies

35. Which of the following is known as design capacity?

(A) Theoretical capacity

(B) Basic capacity

(C) Practical capacity

(D) Possible capacity

36. Los Angeles testing machine is used to conduct

(A) crushing strength test

(B) impact test

(C) attrition test

(D) abrasion test

37. Penetration test on bitumen is used for determining its

(A) grade

(B) ductility

(C) viscosity

(D) temperature susceptibility

38. For carrying out bituminous patchwork during the rainy season, the most suitable binder is

(A) hot bitumen

(B) road tar

(C) bituminous emulsion

(D) cutback bitumen

39. Which of the following is ***not*** water-borne disease?

(A) Typhoid

(B) Malaria

(C) Dysentery

(D) Cholera

40. The maximum permissible limit of fluoride in drinking water is

(A) 0·5 ppm

(B) 1·0 ppm

(C) 1·5 ppm

(D) 2·0 ppm

41. Turbidity is measured on

(A) standard cobalt scale

(B) standard silica scale

(C) standard platinum scale

(D) platinum-cobalt scale

42. The maximum efficiency of BOD removal is achieved in

(A) oxidation pond

(B) trickling filters

(C) oxidation ditch

(D) aerated lagoons

43. Which one of the following methods can be employed for plastic and rubber waste disposal?

(A) Pyrolysis
(B) Incineration
(C) Sanitary landfill
(D) Composting

44. A trickling filter is designed to remove

(A) colloidal solids
(B) settleable solids
(C) dissolved organic matter
(D) None of the above

45. BOD of a town is 25000 kg/day and BOD per capita per day is 50 gram. The population equivalent of the town is

(A) 10000
(B) 50000
(C) 250000
(D) 500000

46. The entry of foul-smelling gases into the house coming from the sewers can be prevented by

(A) exhaust fan
(B) providing water seals for all the fixtures
(C) providing water seals for all the fixtures and vent pipe in the plumbing system
(D) providing sufficient vent pipes in the plumbing system

47. The trap used for a water closet is called as

(A) anti-siphon trap
(B) gully trap
(C) P-trap
(D) intercepting trap

48. The unit in which both sedimentation and digestion processes of sludge take place simultaneously is

(A) detritus tank
(B) Imhoff tank
(C) skimming tank
(D) digestion tank

49. High COD to BOD ratio of an organic pollutant represents

(A) low biodegradability of the pollutant
(B) presence of toxic material in the pollutant
(C) high biodegradability of the pollutant
(D) None of the above

50. Water is known as acidic water if the pH is

(A) less than 6·5
(B) less than 6·0
(C) less than 5·5
(D) All of the above