BPSC AE
(Civil)

Previous Year Paper
(Civil Engg) Paper-VI
11 Nov, 2022

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Booklet Series

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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

BPSC AE (CIVIL)
Advt. No - 07/2020
Exam date - 11/11/2022

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 and the Booklet contains 11 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.

1. When a canal flowing under pressure is carried below a natural drainage such that its FSL does not touch the underside of the supporting structure, the structure so provided, is called

(A) aqueduct

(B) superpassage

(C) siphon-aqueduct

(D) siphon

2. A channel has three reaches P, Q and R connected in series with the following properties :

Reach	*Bed slope*	*Normal depth (in m)*	*Critical depth (in m)*
P	0·0005	2·27	1·29
Q	0·009	0·82	1·29
R	0·005	1·17	1·29

What gradually varied flow profiles will occur?

(A) M_2, S_2, S_3

(B) M_1, S_1, S_3

(C) M_1, H_2, S_2

(D) M_2, S_1, S_3

3. At a gauging site, if Q_r is the discharge at a stage when the water surface is rising and Q_f the discharge at the same stage when the water surface is falling, then

(A) $Q_r > Q_f$

(B) $Q_r = Q_f$

(C) Q_r / Q_f = constant

(D) $Q_r < Q_f$

4. A river carrying a discharge of 100 cumecs has a fall of 200 m. The power available from the fall using an overall efficiency of 85% is

(A) 166·6 MW

(B) 66·67 MW

(C) 166·6 kW

(D) 266·7 MW

5. Power transmitted through pipes will be maximum when

(A) the head due to friction = one-fourth the total head at inlet of the pipe

(B) the head due to friction = the total head at inlet of the pipe

(C) the head due to friction = one-third the total head at inlet of the pipe

(D) the head due to friction = half the total head at inlet of the pipe

6. At two points 1 and 2 in a pipeline, the velocities are V and $2V$ respectively. Both the points are at the same elevation. The fluid density is ρ. The flow can be assumed to be incompressible, inviscid, steady and irrotational. The difference in pressures P_1 and P_2 at points 1 and 2 is

(A) $1{\cdot}5\rho V^2$

(B) $2\rho V^2$

(C) $3\rho V^2$

(D) $0{\cdot}5\rho V^2$

7. Flow net is used for the determination of

(A) quantity of seepage

(B) hydrostatic pressure

(C) exit gradient

(D) All of the above

8. Total Kjeldahl nitrogen is a measure of

(A) total organic and ammonia nitrogen

(B) total ammonia nitrogen

(C) total inorganic and ammonia nitrogen

(D) total organic nitrogen

9. From amongst the following sewage treatment options, the largest land requirement for a given discharge will be needed for

(A) anaerobic pond

(B) oxidation ditch

(C) oxidation pond

(D) trickling filter

10. The relative stability of a sewage sample whose dissolved oxygen is same as the total oxygen required to satisfy the BOD is

(A) 100

(B) infinite

(C) zero

(D) 1

11. If the duty for a crop is 864 hectares per cumec on the field and base period for this crop is 120 days, then the delta for a crop is

(A) 864 cm

(B) 864 m

(C) 120 m

(D) 120 cm

12. The maximum permissible limit for fluoride content in drinking water is

(A) 1·5 mg/l

(B) 5 mg/l

(C) 10 mg/l

(D) 0·1 mg/l

13. Zero hardness of water is achieved by

(A) excess lime treatment

(B) ion-exchange treatment

(C) excess alum and lime treatment

(D) lime-soda process

14. IRC recommends that longitudinal stresses on the bridges should be considered as

(A) 30% of the live load

(B) 20% of the live load

(C) 10% of the live load

(D) 40% of the live load

15. In disinfection, which of the following forms of chlorine is most effective in killing the pathogenic bacteria?

(A) OCl

(B) NH_2Cl

(C) HOCl

(D) Cl

16. For a waste, the 5-day BOD at 20 °C is found to be 200 mg/l. For the same waste, 5-day BOD at 30 °C will be

(A) more than 200 mg/l

(B) 200 mg/l

(C) zero, as the bacteria cannot withstand such high temperature

(D) less than 200 mg/l

17. In water treatment, slow sand filter, when compared to rapid gravity filters, produces

(A) more contaminated effluent

(B) equally contaminated effluent

(C) Uncertain

(D) less contaminated effluent

18. Bitumen of grade 80/100 means

(A) its penetration value is 10 mm

(B) its penetration value is 8 mm to 10 mm

(C) its penetration value is 8 cm to 10 cm

(D) its penetration value is 8 mm

19. As per IRC recommendations, the maximum spacings of expansion and contraction joint in rigid pavements are respectively

(A) 140 m, 4·5 m

(B) 25 m, 40 m

(C) 140 m, 45 m

(D) 45 cm, 4·5 m

20. The speed and delay studies on a defined section of a highway are conducted by

(A) traffic counters

(B) moving car method

(C) enoscope

(D) radar gun

21. In the revised CBR design method recommended by the IRC for the design of flexible pavement, the total thickness depends upon

(A) CBR value of soil and magnitude of wheel load

(B) CBR value of soil and number of commercial vehicles per day

(C) CBR value of soil and cumulative standard axle load

(D) CBR value of soil only

22. As per IRC, the minimum length of transition curve for a mountainous terrain road with radius of curvature 100 m and design speed of vehicle 100 kmph is

(A) 200 m

(B) 100 m

(C) 170 m

(D) 270 m

23. The weight of tracked vehicle considered for class 70R loading as per IRC is

(A) 600 kN

(B) 700 kN

(C) 800 kN

(D) 500 kN

24. The fixed type bearing used in bridges is

(A) sliding plate bearing

(B) elastomeric bearing

(C) RC rocker bearing

(D) None of the above

25. The value of the impact factor for the concrete bridge of 3 m span is

(A) 0·5

(B) 0·7

(C) 0·9

(D) 0·3

26. The minimum width of carriage-way for a two-lane bridge, other than minor village roads and national highways, is

(A) 5·5 m

(B) 7·5 m

(C) 9 m

(D) 4·25 m

27. With the increase in capacity-inflow ratio, the trap efficiency of a reservoir

(A) decreases

(B) remains unchanged

(C) may increase or decrease depending upon reservoir's characteristic

(D) increases

28. The critical shear stress, at which the incipient motion of sediment takes place, is proportional to

(A) d

(B) $d^{3/2}$

(C) d^2

(D) $\sqrt{d}$

where d is grain size.

29. Pure clayey soils are generally not preferred for the central impervious cores of zoned type of earthen dams because

(A) clays are highly impervious

(B) clays are highly pervious

(C) clays are susceptible to cracking

(D) None of the above

30. The line joining the static water levels in several wells excavated through a confined aquifer is known as

(A) piezometric surface

(B) perched water table

(C) hypsometric curve

(D) cone of depression

31. The relation between trans-missibility (T) and permeability (K) for an aquifer of depth (B) is

(A) $T = KB$

(B) $T = K \log B$

(C) $T = \ln(KB)$

(D) $K = TB$

32. For the head regulator, the most severe condition of uplift pressure on the floor occurs when

(A) the canal runs dry and the river flow is at high flood level

(B) the canal runs at full supply depth and the river flow is at pond level

(C) the canal runs dry and the river flow is at pond level

(D) the flow in the level is at flood level and canal is running at full supply depth

33. Canal drops are required to

(A) dissipate excess energy

(B) dissipate inadequate land slope

(C) dissipate excess land slope

(D) None of the above

34. The soil becomes partially infertile when its pH value is about

(A) zero

(B) 7

(C) 11

(D) None of the above

35. Penman's equation is based on

(A) energy budgeting and water budgeting

(B) energy budgeting and mass transfer

(C) water budgeting and mass transfer

(D) energy budgeting only

36. The ratio of AET to PET lies between

(A) 0·6 to 0·9

(B) 0 to 1·0

(C) 0·9 to 1·0

(D) 0 to 0·6

37. A through bridge is one with

(A) bridge flooring provided at the top of superstructure

(B) bridge flooring provided at the bottom of super-structure

(C) bridge flooring provided at some intermediate level of superstructure

(D) None of the above

38. In class B train of vehicles loading, the nose to tail distance between successive trains

(A) shall be less than 18 m

(B) shall not be less than 90·0 m

(C) shall be less than 90·0 m

(D) shall not be less than 18·5 m

39. The term 'wash load' refers to

(A) the suspended load during a flood

(B) the part of suspended load comprising of particles not available in the bed material

(C) the bed load after the fines have been washed out

(D) the saltating part of bed material load

40. Tortuosity in a meandering river is

(A) greater than 1

(B) less than 1

(C) less or greater than 1, depending upon the river

(D) 1

41. A person standing on the bank of a canal drops a stone on the water surface. He notices that the disturbance on the water is not travelling upstream. This is because the flow in the canal is

(A) supercritical

(B) steady

(C) uniform

(D) subcritical

42. A culvert is designed for a peak flow Q_p on the basis of rational formula. If a storm of the same intensity as used in design but of duration twice larger occurs, then the resulting peak discharge will be

(A) $2Q_p$

(B) $Q_p/2$

(C) Q_{p^2}

(D) Q_p

43. Which of the following statements is correct as per Lacey's method for design of alluvial channels?

(A) Hydraulic radius increases with an increase in silt factor.

(B) Wetted perimeter decreases with an increase in design discharge.

(C) Wetted perimeter increases with an increase in silt factor.

(D) Wetted perimeter increases with an increase in design discharge.

44. A stilling basin is the one

(A) which is provided at the foot of a spillway for energy dissipation

(B) which is provided in head race for desilting purposes

(C) which is used to regulate the water supply to a power plant

(D) None of the above

45. A penstock is 3000 m long. Pressure wave travels in it with a velocity 1500 m/s. If the turbine gates are closed uniformly and completely in 4·5 s, then it is called a

(A) slow closure

(B) sudden closure

(C) uniform closure

(D) rapid closure

46. The relationship among specific yield (S_y), specific retention (S_r) and porosity (n) of an aquifer is

(A) $S_y = S_r - n$

(B) $S_y = n - S_r$

(C) $S_y = S_r + 2n$

(D) $S_y = S_r + n$

47. The clogging of well screens and consequent reduction in pump efficiency is indicated by

(A) high value of well losses

(B) low value of well losses

(C) variable value of well losses

(D) None of the above

48. When water flows over a rectangular suppressed weir, the pressure beneath the nape is

(A) slightly above atmospheric

(B) just equal to atmospheric

(C) negative

(D) very high

49. In a barrage, the crest level is kept

(A) high with large gates

(B) high with no gates

(C) low with no gates

(D) low with large gates

50. If the peak load for a power plant equals the plant capacity, then the ratio of capacity factor to load factor will be

(A) 0

(B) > 1

(C) < 1

(D) 1