DO NOT OPEN THE SEAL UNTIL INSTRUCTED TO DO SO

Series : **a**

Question Booklet No.

ESE/25/RT/CVE/2025

CIVIL ENGINEERING

Invigilator's Signature

Candidate's Signature

Time : 3 Hours **Maximum Marks : 200**

ROLL NO. | | | | | | |

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1. The radius of a simple circular curve of arc length 30 m is increased by 50%. The degree of the curve will be

[A] increased by 33.33%

[B] increased by 66.67%

[C] reduced by 33.33%

[D] reduced by 66.67%

2. With a total station, one may determine the actual position of a point in terms of

[A] horizontal angle and elevation only

[B] elevation only

[C] vertical angle and elevation only

[D] Northing, Easting and elevation

3. Which of the following statements is ***correct*** for remote sensing?

[A] Active sensors carry electro-magnetic radiation of a specific wavelength or band of wavelengths to illuminate the earth's surface

[B] Passive sensors carry electro-magnetic radiation of a specific wavelength or band of wavelengths to illuminate the earth's surface

[C] Active sensors sense natural radiations, either reflected or emitted from the earth

[D] Passive sensors sense electromagnetic radiation of a specific wavelength to illuminate the earth's surface

4. For building construction, drones can be used to

[A] lay bricks autonomously from a bird's eye view

[B] cure concrete more quickly from a bird's eye view

[C] replace architectural design software

[D] monitor site progress from a bird's eye view

5. The magnetic bearing of a line was found to be N 60°30′ W in 1984, when the declination was 5°10′ E. Its present magnetic bearing, if the declination is 4°20′ W, is

[A] N 56°10′ W

[B] N 54°50′ W

[C] N 51° W

[D] N 54° W

6. A sample of silty clay has a volume of 14.88 cm^3, containing 5.68 cm^3 of voids, a total mass of 28.81 g, a dry mass of 24.83 g and a specific gravity of solids of 2.7. The degree of saturation is

[A] 50%

[B] 70%

[C] 60%

[D] 80%

7. Two soil samples are said to be similarly graded if

[A] their grain size distribution curves are almost parallel to each other on a semi-logarithmic plot

[B] their grain size distribution curves intersect at a single point on a semi-logarithmic plot

[C] their grain size distribution curves are perpendicular to each other on a semi-logarithmic plot

[D] their grain size distribution curves are perpendicular to each other on a logarithmic plot

8. In a flow net, flow lines and equipotential lines always intersect at

[A] acute angle

[B] right angle

[C] straight angle

[D] obtuse angle

9. A saturated clay layer with single drainage takes 3 years to reach 60% degree of consolidation. If the same clay layer had double drainage, then what would be the time to reach the same degree of consolidation (60%)?

[A] 0.75 year

[B] 1 year

[C] 1.5 years

[D] 2.0 years

10. When the ultimate load is applied on the top of a pile, the load is primarily resisted by which of the following two components?

[A] Skin resistance and lateral earth pressure

[B] Skin resistance and end bearing resistance

[C] End bearing resistance and surcharge load

[D] Shaft resistance and negative skin friction

11. A retaining wall of 8 m height retains sand with a unit weight of 19.36 kN/m^3 and an angle of internal friction of 45°. At location *A*, the surface of the backfill slopes upward at 30° to the horizontal and at location *B*, it slopes upward at 45°. The ratio of active earth pressure at location *A* to that at location *B* is

[A] 0.132

[B] 0.866

[C] 0.707

[D] 0.328

12. The nominal distance of a boundary layer is defined as the distance from the wall to a point

[A] where the velocity is 99% less than the free stream velocity

[B] where the velocity is 99% of its free stream velocity

[C] where the velocity ceases to be laminar

[D] where the velocity is within 90% of the free stream velocity

13. In calculating the lift force on a body

[A] the frontal area is always used

[B] the planform area is always used

[C] the actual surface area of the body is used

[D] the planform area is used if the body is a lifting surface

14. Two pipelines of equal length and diameters 20 cm and 40 cm respectively are connected in parallel between two reservoirs. If the friction factor *f* is the same for both pipes, then the ratio of the discharges in the larger to the smaller pipe is

[A] 2

[B] 5.657

[C] 2.828

[D] 1.414

15. The alternate depths for a certain flow in a rectangular open channel, corresponding to a specific energy, are 0.5 m and 2.0 m respectively. The critical depth for this channel is

[A] 0.928 m

[B] 1.250 m

[C] 0.500 m

[D] 2.004 m

16. A stratified unconfined aquifer consists of three horizontal layers with thicknesses of 3 m, 2 m and 5 m. The corresponding coefficients of permeability are 30 m/day, 10 m/day and 20 m/day respectively. If the flow is parallel to the stratification, then the equivalent coefficients of permeability and transmissibility of the aquifer are, respectively

[A] 10 m/day and 210 m^2/day

[B] 21 m/day and 210 m^2/day

[C] 21 m/day and 60 m^2/day

[D] 6 m/day and 60 m^2/day

17. The 12-hour unit hydrograph of a catchment is triangular in shape with a base width of 144 hours and a peak discharge value of 32 m^3/s. This unit hydrograph refers to a catchment of area

[A] 8294 hectares

[B] 82944 hectares

[C] 92840 hectares

[D] 9284 hectares

18. At place *A*, wheat requires 7.5 cm of water after every 20 days and at place *B*, it requires 7 cm of water after every 28 days. If the base period for wheat is 140 days, then the ratio of the total delta required at place *A* to that at place *B* is

[A] 1.07

[B] 1.40

[C] 1.50

[D] 0.67

19. A cross-drainage structure is required at the intersection of a canal and a natural drain. Depending on their relative levels, the structure varies as follows :

- If the Full Supply Level (FSL) of the canal is sufficiently below the bottom of the drain, allowing the canal water to flow freely under gravity, the structure is known as a _____.
- If the High Flood Level (HFL) of the drain is sufficiently below the bottom of the canal, allowing the drain water to flow freely under gravity, the structure is known as a _____.

Choose the ***correct*** option to fill in the blanks :

[A] aqueduct, super-passage respectively

[B] super-passage, aqueduct respectively

[C] syphon, super-passage respectively

[D] aqueduct, syphon respectively

20. The instruments used to mark the end of each chain during chaining and to set out right angles in chain surveys are, respectively

[A] optical square and arrows

[B] cross-staff and compass

[C] cross-staff and ranging rod

[D] arrows and optical square

21. A cylindrical sample of saturated clay, 4 cm in diameter and 8 cm high, was tested in an unconfined compression strength test apparatus. If the specimen failed under an axial load of 360 N, with an axial deformation of 8 mm at failure, then the Unconfined Compressive Strength (UCS) is

[A] 208 kN/m^2

[B] 158 kN/m^2

[C] 258 kN/m^2

[D] 230 kN/m^2

22. A simply supported beam of 9 m span carries a uniformly distributed load of 5 kN/m over the middle third of the span (from 3 m to 6 m). The ratio of the maximum bending moment to the maximum shear force in the beam is

[A] 3.75 m

[B] 1.40 m

[C] 4.50 m

[D] 5.0 m

23. The minimum diameter of a steel wire used to raise a load of 4000 N, if the maximum allowable stress in the wire is 95 MN/m^2, is

[A] 3.72 mm

[B] 7.32 mm

[C] 2.73 mm

[D] 9.32 mm

24. The ratio of the maximum distance of the neutral axis from the top fiber of a Reinforced Concrete (RCC) beam to its effective depth is

[A] independent of the grades of concrete and steel

[B] changes with the grades of both concrete and steel

[C] independent of the grade of steel but changes with the grade of concrete

[D] independent of the grade of concrete but changes with the grade of steel

25. As per IS 456:2000, the effective span of a simply supported beam is

[A] higher of clear span minus effective depth and distance between centers of supports

[B] lower of clear span minus effective depth and distance between centers of supports

[C] lower of clear span plus effective depth and distance between centers of supports

[D] higher of clear span plus effective depth and distance between centers of supports

26. As per IS 800:2007, for elements that exceed the semi-compact limits, the class of sections to be considered is

[A] plastic section

[B] slender section

[C] compact section

[D] semi-compact section

27. As per IS 800:2007, the design strength of a steel member under axial tension is the lowest of the design strength due to

[A] yielding of gross section, rupture of critical section and block shear

[B] yielding of net section, rupture of gross section and block shear

[C] yielding of gross section, rupture of gross section and buckling shear

[D] yielding of net section, rupture of critical section and block shear

28. A three-hinged parabolic arch with a span of 25 m and a central rise of 5 m is subjected to a uniformly distributed load of 15 kN/m over the left half of the span. The maximum bending moment at the central hinge is

[A] 0 (zero)

[B] 146.49 kNm

[C] 93.75 kNm

[D] 0.76 kNm

29. A rectangular column of width 200 mm and thickness 150 mm carries a point load of 240 kN at an eccentricity of 10 mm. The maximum and minimum stresses on the section are, respectively

[A] 12.4 MPa and 5.6 MPa

[B] 10.4 MPa and 5.6 MPa

[C] 10.4 MPa and 8.6 MPa

[D] 13.8 MPa and 8.6 MPa

30. A simply supported beam *AB* of length 7 m is supported by a roller at point *A* and a pin at point *B*. The beam carries a 600 N force inclined downward to the right at 45°, located 2 m from support *A*, a 100 N vertical downward force located 2 m from support *B* and a 200 N vertical downward force applied directly at support *B*. The horizontal and vertical components of the reaction force at support *B* are, respectively

[A] 424.26N ($\rightarrow$), 300.65 ($\uparrow$)

[B] 300N ($\leftarrow$), 724.24 ($\uparrow$)

[C] 424.26N ($\leftarrow$), 392.65 ($\uparrow$)

[D] 300N ($\rightarrow$), 392.65 ($\uparrow$)

31. For a given (constant) coefficient of lateral friction, the required super-elevation on a highway curve increases with

[A] increase in vehicle speed and decrease in radius of the curve

[B] decrease in vehicle speed and increase in radius of the curve

[C] increase in radius of the curve only

[D] decrease in vehicle speed only

32. A secondary clarifier handles a total flow of 10000 m^3/d from the aeration tank of conventional activated sludge treatment system. The concentration of solids in the flow from the aeration tank is 4000 mg/l. The clarifier is required to thicken the solids to 12000 mg/l and hence it is to be designed for a solid flux of 3.2 kg/m^2h. The surface area of the designed clarifier for thickening (in m^2, in integer) is

[A] 320

[B] 580

[C] 521

[D] 425

33. What percentage of commercial vehicles in each direction should be considered for the design of dual two-lane carriageway roads with flexible pavement (IRC : 37-2018)?

[A] 75%

[B] 60%

[C] 50%

[D] 45%

34. Which of the following statements is ***correct*** for the design criterion of rigid pavement (IRC : 58-2015)?

[A] A rigid pavement is deemed to have failed if sum of cumulative fatigue damages is greater than one

[B] A rigid pavement is safe if sum of cumulative fatigue damages is greater than one

[C] A rigid pavement is deemed to have failed only if cumulative fatigue damages due to wheel load and curling stresses at the bottom do not exceed one

[D] A rigid pavement is deemed to have failed only if cumulative fatigue damages due to wheel load and curling stresses at the top do not exceed one

35. The speeds of five vehicles in km/h are 40, 43, 45, 47 and 50. Time mean speed and standard deviation are, respectively

[A] 50 km/h and 0 km/h

[B] 40 km/h and 1.87 km/h

[C] 45 km/h and 1.87 km/h

[D] 45 km/h and 3.81 km/h

36. At a right angle, four-legged road intersection with two-way traffic on all approaches, the number of crossing conflict points is

[A] 16

[B] 24

[C] 8

[D] 32

37. The shapes of the STOP sign and the speed limit sign are, respectively

[A] circular and octagonal

[B] octagonal and circular

[C] triangular and circular

[D] octagonal and triangular

38. The free-flow speed of a traffic stream on a single-lane roadway is 80 km/h. Under stopped conditions, the average spacing between vehicles is 10 m. The capacity of the flow per lane is

[A] 800 veh/h

[B] 8000 veh/h

[C] 2000 veh/h

[D] 4000 veh/h

39. IRC Class 70R loading is applicable only for bridges having a carriageway width of _____ and above, and the maximum load for the wheeled vehicle shall be _____ for a single axle.

Choose the ***correct*** option to fill in the blanks :

[A] 2.9 m, 20 tonnes respectively

[B] 5.3 m, 20 tonnes respectively

[C] 2.9 m, 40 tonnes respectively

[D] 5.3 m, 40 tonnes respectively

40. Which one of the following is ***not*** a basic function of bridge abutments?

[A] To support the bridge deck at the ends

[B] To retain the approach road embankment

[C] To allow expansion of bridge girders during temperature changes

[D] To resist lateral and horizontal forces from earth pressure

41. Which of the following is ***not*** a chemical examination of water?

[A] Total solids test

[B] Turbidity test

[C] Dissolved gases test

[D] Chloride test

42. Calculate the quantity of bleaching powder required per day to disinfect 4 million litres of water per day. If the required chlorine dose is 0.5 p.p.m. and the bleaching powder contains 30% available chlorine.

[A] 6.67 kg

[B] 2 kg

[C] 20 kg

[D] 66.7 kg

43. The process of crushing and grinding Municipal Solid Waste (MSW) as a method of disposal is known as

[A] composting

[B] incineration

[C] shredding

[D] pulverization

44. Assuming a maximum velocity (at peak flow) of 0.8 m/s through the screen, what is the net area of screen openings required for a plant treating a peak sewage flow of 60 million litres per day?

[A] 0.563 m^2

[B] 0.694 m^2

[C] 0.868 m^2

[D] 0.600 m^2

45. Which of the following is ***not*** an important primary air pollutant?

[A] Oxides of sulphur

[B] Oxides of carbon

[C] Sulphuric acid

[D] Oxides of nitrogen

46. Phyto-toxicological effects due to air pollution are observed in

[A] animals

[B] soil

[C] water bodies

[D] plants

47. Rainout is a process associated with

[A] soil erosion due to rainfall from the atmosphere by precipitation

[B] removal of pollutants from the atmosphere by precipitation

[C] surface runoff

[D] groundwater recharge

48. The pipe, which is used to carry the discharge from sanitary fittings like bathrooms, kitchens etc., is called

[A] vent pipe

[B] soil pipe

[C] anti-siphonage pipe

[D] waste pipe

49. According to IS 456 : 2000, the recommended maximum cement content in concrete mix proportion, excluding mineral admixtures such as fly ash or Ground Granulated Blast Furnace Slag (GGBS), is

[A] 450 kg/m^3

[B] 380 kg/m^3

[C] 300 kg/m^3

[D] 220 kg/m^3

50. According to IS 456 : 2000, the maximum strain in the tension reinforcement (having yield stress f_y and modulus of elasticity E_s) in a section at failure shall not be less than

[A] $\frac{f_y}{1.15E_S} + 0.002$

[B] $\frac{f_y}{1.15E_S} + 0.02$

[C] $\frac{f_y}{1.15E_S} + 0.0035$

[D] $\frac{E_S}{1.15f_y} + 0.002$

51. What does CPM stand for?

[A] Cost Performance Measurement

[B] Critical Path Method

[C] Critical Planning Management

[D] Construction Planning and Management

52. In PERT (Program Evaluation and Review Technique), what are the three-time estimates for each activity?

[A] Early start, late start and average

[B] Shortest, longest and most likely

[C] Optimistic, pessimistic and most likely

[D] Optimistic, pessimistic and average

53. Which one of the following tools/instruments is ***not correctly*** matched with its corresponding method of surveying?

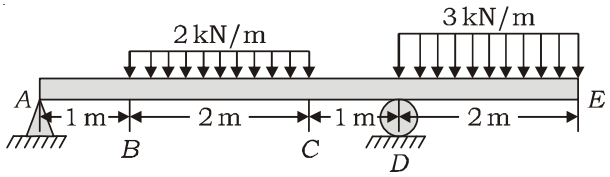
[A] Theodolite – Angular measurement

[B] Alidade – Plane table surveying

[C] Bubble tube – Chain survey

[D] Hand level – Levelling

54. Determine the distance of the point of contraflexure from point *A* for the beam shown in the following figure.



[A] 1 m

[B] 2 m

[C] 4 m

[D] 5 m

55. A copper rod tapers uniformly from 60 mm diameter to 32 mm diameter in a length of 440 mm. The rod is subjected to an axial load of 12 kN and $E = 1.10 \times 10^5$ N/mm^2. What is the extension of the rod in mm?

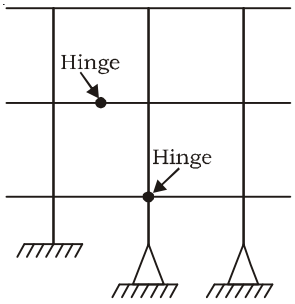
[A] $\frac{2}{5\pi}$

[B] $\frac{3}{10\pi}$

[C] $\frac{1}{5\pi}$

[D] $\frac{1}{10\pi}$

56. The degree of static indeterminacy of the plane frame as shown in the figure is



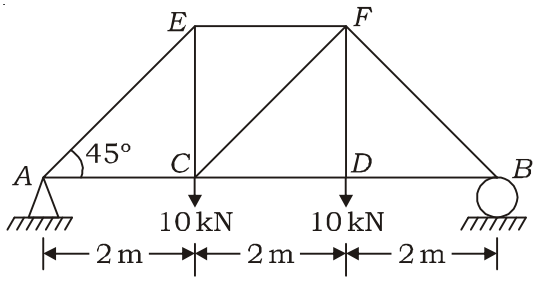
[A] 12

[B] 16

[C] 15

[D] 19

57. In the truss shown in the figure, which one of the following members has ***no*** force induced in it?



[A] *CE*

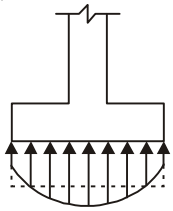
[B] *CF*

[C] *CD*

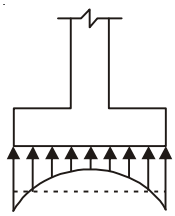
[D] *DF*

58. The nature of contact pressure distribution under a rigid footing resting on a sandy soil and subjected to uniformly distribution load is shown in which of the following figures?

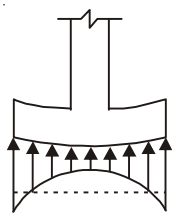
[A]



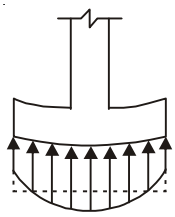
[B]



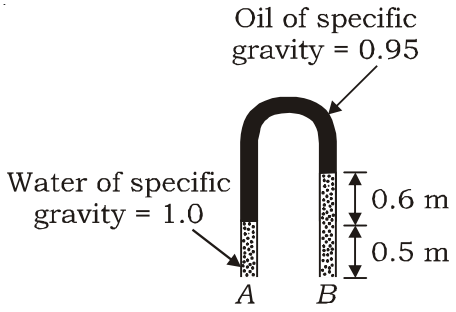
[C]



[D]



59. In the setup shown in the figure, assuming the specific weight of water as 10 kN/m^3, determine the pressure difference between points *A* and *B*.



[A] –100 N/m^2

[B] –570 N/m^2

[C] –300 N/m^2

[D] –430 N/m^2

60. Which one of the following is ***not correctly*** matched?

[A] Euler Number- $\sqrt{\frac{\text{Inertia force}}{\text{Pressure force}}}$

[B] Weber Number- $\sqrt{\frac{\text{Inertia force}}{\text{Surface tension force}}}$

[C] Reynolds Number- $\sqrt{\frac{\text{Inertia force}}{\text{Bouyant force}}}$

[D] Froude Number- $\sqrt{\frac{\text{Inertia force}}{\text{Gravitational force}}}$

61. An isohyet is a line joining points of

[A] equal evaporation

[B] equal pressure

[C] equal elevation

[D] equal rainfall

62. To derive the total flood hydrograph at a catchment outlet from an isolated storm, which of the following is the ***correct*** sequence of steps to be followed?

P. Obtaining the hyetograph

Q. Addition of baseflow

R. Estimation of initial and infiltration losses

S. Application of unit hydrograph

[A] PRQS

[B] PQRS

[C] PRSQ

[D] RQSP

63. What is the relation between Consumptive Irrigation Requirement (CIR), Net Irrigation Requirement (NIR), Field Irrigation Requirement (FIR) and Gross Irrigation Requirement (GIR)?

[A] CIR > FIR > NIR > GIR

[B] GIR > NIR > FIR > CIR

[C] NIR < GIR < FIR < CIR

[D] GIR < FIR < CIR < NIR

64. A vehicle has a wheel base of 6.6 m. What is the off tracking while negotiating a curved path with a mean radius of 33 m?

[A] 0.72 m

[B] 0.66 m

[C] 0.54 m

[D] 0.57 m

65. As per IRC-6:2017, what is the formula for calculating the impact factor for reinforced concrete bridges designed for class *A* or class *B* loading, where *L* is the span length in metres?

[A] $\frac{9}{13.5 + L}$

[B] $\frac{6}{4.5 + L}$

[C] $\frac{13.5}{9 + L}$

[D] $\frac{4.5}{6 + L}$

66. Which one of the following statements is ***not correct*** as per Central Pollution Control Board (CPCB) norms for sewage treatment plants?

[A] Biological Oxygen Demand (BOD) of treated water should not exceed 10 mg/L

[B] Total Suspended Solids (TSS) in treated water is limited to 20 mg/L

[C] Nitrogen and phosphorus levels must meet specific limits to prevent waterbody eutrophication

[D] pH of treated water should be between 7.5 to 10.5

67. Which of the following air pollutants are primarily ***not*** responsible for causing acid rain?

1. Carbon monoxide (CO)
2. Sulphur dioxide (SO_2)
3. Ozone (O_3)
4. Lead (Pb)
5. Nitrogen dioxide (NO_2)

Choose the ***correct*** answer from the options given below :

[A] 2 and 5 only

[B] 1, 2 and 5 only

[C] 1, 3 and 4 only

[D] 1, 4 and 5 only

68. Which of the following is the aerobic method of mechanical composting practiced in India?

[A] Bangalore method

[B] Indore method

[C] Bhopal method

[D] Nagpur method

69. Consider the following oxides :

1. CaO
2. Al_2O_3
3. SiO_2

The ***correct*** sequences in increasing order of their percentage content in ordinary Portland cement and brick respectively, are

[A] 1-2-3 and 2-3-1

[B] 1-2-3 and 3-2-1

[C] 2-3-1 and 1-2-3

[D] 3-2-1 and 1-2-3

70. Which of the following is ***not correctly*** matched?

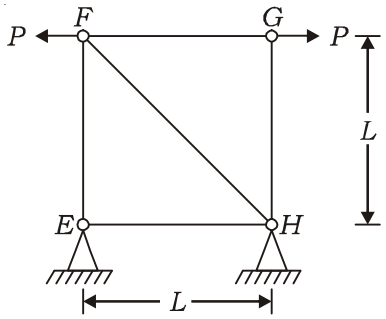
[A] Needle vibrator — Compaction of concrete

[B] Concrete pump — Transport concrete through pipelines

[C] Tremie pipe — Extract excess water from the surface

[D] Agitator truck — Transport and continuously rotate freshly mixed concrete

71. A truss *EFGH* is shown in the figure, in which all the members have the same axial rigidity AE in the figure, *P* is the magnitude of external horizontal acting at joints *F* and *G*. If AE = 700×10^3 kN, *P* = 180 kN and *L* = 3.5 m, then the magnitude of the horizontal displacement of point *G* (in mm, round off to one decimal place) is



[A] 0.09

[B] 0.9

[C] 1.9

[D] 1.09

72. Which of the following are the liquid forms of particulate air pollutants?

[A] Fly ash and fumes

[B] Smoke and spray

[C] Dust and mist

[D] Mist and spray

73. Which of the following ***correctly*** describes pyrolysis?

[A] An exothermic process occurring without oxygen

[B] An exothermic process occurring with oxygen

[C] An endothermic process occurring without oxygen

[D] An endothermic process occurring with abundant oxygen

74. A staff is placed on a Benchmark (BM) of Reduced Level (RL) 100.000 m and a theodolite is placed at a horizontal distance of 60 m from the BM to measure the vertical angles. The measured vertical angles from the horizontal at the staff readings 0.5 m and 2.5 m are found to be same. Taking the height of the instrument as 1.500 m, the RL of the theodolite station is

[A] 100.000 m

[B] 100.200 m

[C] 99.4 m

[D] 98.5 m

75. The true length of a line is known to be 200 m. When this is measured with a 20 m tape, the length is 200.90 m. The correct length of 20 m tape is

[A] 200 m

[B] 200.90 m

[C] 220.00 m

[D] 19.910 m

76. A highway designed for 90 km/h speed has a horizontal curve section with a radius of 250 m. If the design lateral friction is assumed to develop fully, then the required super elevation is

[A] 0.02

[B] 0.05

[C] 0.07

[D] 0.105

77. With respect to fluid flow, match the following in **Column X** with **Column Y** :

Column X		**Column Y**
(P) Viscosity	*(I)*	Mach number
(Q) Gravity	*(II)*	Reynolds number
(R) Compressibility	*(III)*	Euler number
(S) Pressure	*(IV)*	Froude number

Which one of the following combination is ***correct***?

	(P)	*(Q)*	*(R)*	*(S)*
[A]	*(II)*	*(IV)*	*(I)*	*(III)*
[B]	*(III)*	*(IV)*	*(I)*	*(II)*
[C]	*(IV)*	*(II)*	*(I)*	*(III)*
[D]	*(II)*	*(IV)*	*(III)*	*(I)*

78. The point where the road alignment changes from a tangent to a curve is known as

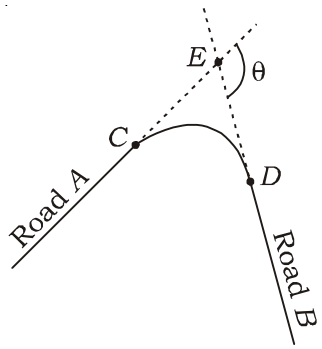
[A] point of deflection

[B] point of curve

[C] point of intersection

[D] point of tangency

79. Road *A* and road *B* are joined by a circular horizontal curve of radius 300 m as shown in the figure. Road *A* and road *B* are tangential to the curve at the points *C* and *D* respectively. Had the curve not been there, straight roads *A* and *B* would have met at the point *E*. The distance from *C* to *E* is 94.6 m. The value of angle θ is



[A] 35°

[B] 33°

[C] 32°

[D] 36°

80. In Darcy's law, the velocity of flow through porous media is directly proportional to the first power of the hydraulic gradient. This law is applicable to

[A] laminar flow in porous media

[B] transitional flow in porous media

[C] turbulent flow in porous media

[D] laminar as well as turbulent flow in porous media

81. If a water tank partially filled with water is being carried on a truck, moving with a constant horizontal acceleration, then the level of the liquid will

[A] rise on the front side of the tank

[B] fall on the back side of the tank

[C] remain the same at both sides of the tank

[D] rise on the back side and fall on the front side

82. A Pitot tube is a device used in flowing fluid for measuring

[A] discharge

[B] pressure

[C] velocity

[D] kinetic energy and potential energy

83. In the design of a bolted double cover butt joint, the bolt must be checked for which of the following conditions to ensure adequate strength?

[A] Single shear only

[B] Single shear and bearing

[C] Double shear and bearing

[D] Bearing only

84. The maximum permissible speed on a horizontal curve of radius 130 m of a highway, if the super elevation is restricted to 5% and permissible value of the friction coefficient is 0.12, is

[A] 60 km/hr

[B] 43 km/hr

[C] 63 km/hr

[D] 53 km/hr

85. The basic capacity of a traffic lane located at Itanagar at a speed of 45 kmph with all vehicles having average length of 6.0 m and an average reaction time of 2.1 sec will be

[A] 1395 vehicles/hour/lane

[B] 1265 vehicles/hour/lane

[C] 1425 vehicles/hour/lane

[D] 1521 vehicles/hour/lane

86. For designing a hill road, what combination should typically be provided as per standard practice?

[A] Minimum sight distance equals to stopping sight distance and maximum ruling gradient of 5%

[B] Minimum sight distance equals to passing sight distance and maximum ruling gradient of 5%

[C] Minimum sight distance equals to braking distance and maximum ruling gradient of 3.33%

[D] Minimum sight distance equals to braking distance and maximum ruling gradient of 6.66%

87. In project scheduling, what is the name given to the time by which completion of an activity can be delayed without affecting the earliest start of any immediately succeeding activity?

[A] Total float

[B] Interfering float

[C] Independent float

[D] Free float

88. PERT calculations show that the project duration is 60 weeks with a variance of 9 weeks. If the probability factor (Z) corresponding to 95% probability is 1.647, then estimate the number of weeks required to complete the project with 95% probability.

[A] 60.94

[B] 62.94

[C] 64.94

[D] 66.94

89. Given are the following construction activities :

(a) Pouring of concrete

(b) Erection of formwork

(c) Curing of concrete

(d) Removal of formwork

What is the ***correct*** sequence of these activities on a project network?

[A] *(a) – (b) – (c) – (d)*

[B] *(b) – (a) – (d) – (c)*

[C] *(b) – (a) – (c) – (d)*

[D] *(a) – (c) – (b) – (d)*

90. A triaxial test was conducted on a granular soil. At failure, the ratio of major to minor effective principal stresses is $\frac{\sigma'_1}{\sigma'_3} = 3.25$. The effective minor principle stress (σ'_3) at failure is 75 kPa. The values of approximate ϕ and the principal stress difference at failure are, respectively

[A] 45° and 570 kPa

[B] 32° and 168.75 kPa

[C] 35° and 205.22 kPa

[D] 40° and 205.22 kPa

91. A footing in sandy soil has an allowable bearing capacity of 160 kN/m^2 corresponding to an allowable settlement of 24 mm. If the settlement criterion is relaxed to 36 mm, then what will be the new allowable bearing capacity?

[A] 240 kN/m^2

[B] 300 kN/m^2

[C] 350 kN/m^2

[D] 400 kN/m^2

92. The total passive earth pressure per m length against a retaining of height 2.25 m with backfill of unit weight 16 kN/m^3 and angle of internal friction 25° will be

[A] 99.85 kN/m

[B] 300.3 kN/m

[C] 250.2 kN/m

[D] 150.6 kN/m

93. The settling velocity of sediment particles of diameter 0.04 mm and of specific gravity 2.62, when settling in water medium, with kinematic viscosity $(\nu) = 1 \times 10^{-6}\ m^2/sec$ will be

[A] 1.62 mm/sec

[B] 1.41 mm/sec

[C] 2.24 mm/sec

[D] 1.15 mm/sec

94. The concentration of OH^- ion in a water sample is measured as 17mg/l at 25° C. The pH of the water sample will be

[A] 11

[B] 10

[C] 12

[D] 13

95. A tachometer has the focal length of the objective glass 220 mm, stadia interval of 1.25 mm and the distance from object glass to the trunnion axis of 130 mm, the additive constant is

[A] 0.35 m

[B] 0.22 m

[C] 0.3625 m

[D] 0.221 m

96. In a traverse survey, in order to obtain WCB of the next traverse leg, add the traverse angle to the bearing of the previous leg and if the sum is more than 540°, subtract

[A] 180°

[B] 360°

[C] 540°

[D] 90°

97. In a closed traverse, the algebraic sum of latitudes = +1.53 m and the algebraic sum of departures = –3.29 m. The length and bearing of the closing error will be

[A] 2.577 m, 57°21′23″

[B] 3.63 m, 57°21′23″

[C] 3.63 m, 65°3′34″

[D] 2.577 m, 65°3′34″

98. If P is the percentage of water required for determination of normal consistency of cement, then the percentage of water to be added for determination of initial setting time is

[A] $0.7P$

[B] $0.85P$

[C] $0.75P$

[D] $0.8P$

99. A 3.5 m long beam, simply supported at its ends, carries a point load of P at the centre. If the slope of the beam at each support is 2°, then the deflection of the beam at the centre will be

[A] 10.5 mm

[B] 40.7 mm

[C] 23.2 mm

[D] 18.3 mm

100. A reinforced concrete beam section has a size of 250 mm width and 450 mm effective depth. The grade of concrete is M25 and grade of steel is Fe500. If the ultimate bending moment of 250 kN-m acts at the section, then the beam has to be designed as

[A] singly reinforced beam

[B] doubly reinforced beam

[C] balanced section

[D] either singly or doubly reinforced beam

SPACE FOR ROUGH WORK

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PROVISIONAL ANSWER KEY OF

ARUNACHAL ENGINEERING SERVICE

(RECRUITMENT TEST) EXAMINATION-2025

CIVIL ENGINEERING

SET- A

Q NO.	ANS
1	C
2	D
3	A
4	D
5	C
6	B
7	A
8	B
9	A
10	B
11	D
12	B
13	D
14	B
15	A
16	B
17	B
18	C
19	B
20	D
21	C
22	A
23	B
24	D
25	C

Q NO.	ANS
26	B
27	A
28	A
29	B
30	C
31	A
32	C
33	A
34	A
35	D
36	A
37	B
38	C
39	B
40	C
41	B
42	A
43	D
44	C
45	C
46	D
47	B
48	D
49	A
50	A

Q NO.	ANS
51	B
52	C
53	C
54	B
55	D
56	A
57	B
58	A
59	C
60	C
61	D
62	C
63	B
64	B
65	D
66	D
67	C
68	B
69	C
70	C
71	B
72	D
73	C
74	A
75	D

Q NO.	ANS
76	D
77	A
78	B
79	A
80	A
81	D
82	C
83	C
84	D
85	A
86	A
87	D
88	C
89	C
90	B
91	A
92	A
93	B
94	A
95	A
96	B
97	C
98	B
99	B
100	B