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UPPSC-AE

CIVIL ENGINEERING (Paper-2)

**Part - B : Technical Questions
and Detailed Solution**

**Exam Held on
29 May 2022**

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26. The unit power P_u of a turbine developing a power P under a head H is equal to

- (a) $PH^{3/2}$ (b) $\frac{P}{H^{3/2}}$
(c) $\frac{P}{H^{5/2}}$ (d) $P\sqrt{H}$

• **Ans. (b)**

$$P_u = \frac{P}{H^{3/2}}$$

27. Errors arising from carelessness of the observer are known as

- (a) compensating errors
(b) systematic errors
(c) mistakes
(d) discrepancy

• **Ans. (c)**

28. For non - passing sight distance, the height of stationary object considered is

- (a) 50 cm (b) 65 cm
(c) 10 cm (d) 15 cm

• **Ans. (d)**

Non passing sight distance (SSD)

height of stationary object = 0.15 m

height of eye-level of driver = 1.2 m

29. Various water treatment processes are listed below :

1. Filtration
2. Chlorination
3. Sedimentation
4. Coagulation
5. Flocculation

The correct sequence of these processes in a conventional water treatment scheme is

- (a) 3, 4, 5, 1, 2
(b) 1, 3, 4, 2, 5
(c) 5, 1, 2, 3, 4
(d) 4, 5, 3, 1, 2

• **Ans. (d)**

30. If the base period of a 6 hr. unit hydrograph of a basin is 84 hr. then, the base period of a 12 hr. unit hydrograph of the same basin will be

- (a) 72 hr (b) 168 hr
(c) 90 hr (d) 84 hr

• **Ans. (c)**

$$n = 12/6 = 2$$

$$\begin{aligned} t_B &= t_D + (n - 1)D \\ &= 84 + (2 - 1) \times 6 \\ &= 84 + 6 \\ &= 90 \text{ hr} \end{aligned}$$

31. Zero hardness of water is achieved by

- (a) Ion exchange method
(b) Using excess alum dosage
(c) Using lime soda process
(d) Excess lime treatment

• **Ans. (a)**

32. While testing for COD of sewage, organic matter is oxidised by $K_2Cr_2O_7$, in the presence of

- (a) HNO_3 (b) HCl
(c) H_2SO_4 (d) None of these

• **Ans. (c)**

33. Indian Road Congress was formed in the following year

- (a) 1939 (b) 1943
(c) 1929 (d) 1934

• **Ans. (d)**

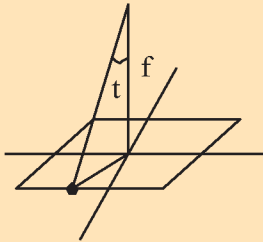
IRC was formed in the 1934

34. If 'f' is the focal length of camera and 't' is the tilt angle, distance of the photo nadir from the principal point will be

- (a) $t \tan \theta$ (b) $t \cot \theta$
(c) $t \sin \theta$ (d) $t \cos \theta$

• **Ans. (b)**

$$x = f \cot(t)$$



$$\tan(t) = \frac{f}{x}$$

35. Which of the following is one of the factor influencing the provision of camber ?

- (a) Sub - grade characteristics
(b) Drainage
(c) Topography
(d) Amount of rainfall

• **Ans. (d)**

Factors are influencing the provision of camber

- (i) Type of pavement
(ii) Amount of rainfall

36. Benkelman beam deflection method is used for design of

- (a) Flexible overlays on flexible pavements
(b) Flexible overlays on rigid pavements
(c) Rigid overlays on rigid pavements
(d) Rigid overlays on flexible pavements

• **Ans. (a)**

Benkelman beam deflection method is used for design of flexible overlays on flexible pavements.

37. The device , which can be used to control gaseous as well as particulate pollutants in the industrial emissions is known as

- (a) Fabric filter
(b) Dynamic precipitator
(c) Spray tower
(d) Cyclone

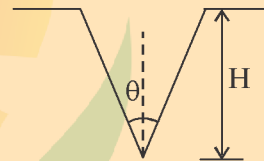
• **Ans. (b)**

38. The discharge through a V - notch varies as (where, H is the head)

- (a) $H^{5/2}$ (b) $H^{5/4}$
(c) $H^{1/2}$ (d) $H^{3/2}$

• **Ans. (a)**

$$V\text{-Notch-Q} = \frac{8}{15} C_d \tan\left(\frac{\theta}{2}\right) \sqrt{2g} H^{5/2}$$



39. An unconformity is

- (a) A layer of clay or shale in an igneous mass
(b) A type of joints especially associated with folded and faulted rocks
(c) A surface of erosion or non - deposition as detected in a sequence of rocks
(d) A layer of boulders and pabbles in a sequence of rocks

• **Ans. (c)**

40. Which one of the following specifications for the length of base line refers to " third order Triangulation " system ?

- (a) 5.0 to 15 km (b) 10 to 20 km
(c) 0.5 to 3.0 km (d) 1.5 to 5.0 km

• **Ans. (c)**

Primary $\Rightarrow$ 5-15 km

Secondary $\Rightarrow$ 1.5 - 5 km.

Third order $\Rightarrow$ 0.5-3 km

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

(a) Pyrolysis
(b) Incineration
(c) Sanitary landfill
(d) Composting

$$W_m = \frac{n l^2}{2R}$$

$$W_m = \frac{3 l^2}{2R}$$

• **Ans. (a)**

42. Geostationary satellites have,

(a) same mass as global weight
(b) same angle with geodetic stations
(c) same distance from earth's centre
(d) same speed as earth's rotation

• **Ans. (d)**

43. If the base period is 100 days and the duty of the canal is 1000 hectares per cumec, the depth of water will be

(a) 86.4 cm (b) 864 cm
(c) 0.864 cm (d) 8.64 cm

• **Ans. (d)**

$$D = \frac{8.64 \times 100}{1000} = 86.4 \text{ cm}$$

44. The mechanical extra widening required for 10.5 m wide pavement on a horizontal curve of radius R meter is given by

(a) $\frac{l^2}{R}$ (b) $\frac{3l^2}{2R}$
(c) $\frac{l^2}{2R}$ (d) $\frac{2l^2}{3R}$

where, l is the length of wheel base of the vehicle in meters.

• **Ans. (b)**

Pavement width = 10.5 m

$$\text{Number of lane} = \frac{10.5}{3.5} = 3$$

$$(\therefore W_{\text{single}} = 3.5 \text{ m})$$

45. The observation of two photographs simultaneously is called

(a) spectomy (b) stereoscopy
(c) orthography (d) spectrometry -

• **Ans. (b)**

46. If the reduced bearing of a line AB is $N60^\circ W$ and length is 100 m, then the latitude and departure of the line AB will be

(a) + 50 m, - 86.6 m
(b) + 70.7 m, - 50.0 m
(c) +50 m, + 86.6 m
(d) + 86.6 m, - 50.0 m

• **Ans. (a)**

$$L = 100 \cos(300^\circ) = 50 \text{ m}$$

$$D = 100 \sin(300^\circ) = -86.6 \text{ m}$$

47. The product of traffic density and traffic speed is termed as

(a) Basic capacity (b) Traffic volume
(c) Traffic capacity (d) None of the above

• **Ans. (b)**

$$\begin{aligned} \text{traffic volume (q)} &= \text{density} \times \text{velocity (speed)} \\ &= \text{Veh/km} \times \text{km /hr} \\ &= \text{Veh/hr} \end{aligned}$$

48. The flow velocity in a sewer does NOT depend on

(a) its hydraulic mean depth
(b) its roughness
(c) its grade
(d) its length

• **Ans. (d)**

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49. A camera equipped with a 152 mm focal length lens, is used to take a vertical photograph from a flying height of 2780 m above mean sea level. If the terrain is flat with an elevation of 500 m, the scale of the photograph will be

(a) 1 : 22,000 (b) 1 : 24,500
(c) 1 : 15,000 (d) 1 : 20,000

• **Ans. (c)**

$$f = 152 \text{ mm}$$

$$h = 500 \text{ m}$$

$$H = 2780 \text{ m}$$

$$S = \frac{f}{(H - h)}$$

$$= \frac{152 \text{ mm}}{(2780 - 500)}$$

$$= \frac{1}{15000}$$

50. The natural process under which the flowing river water gets cleaned, is known as
- (a) Oxidation (b) Self - purification
(c) Photo - synthesis (d) None of these x

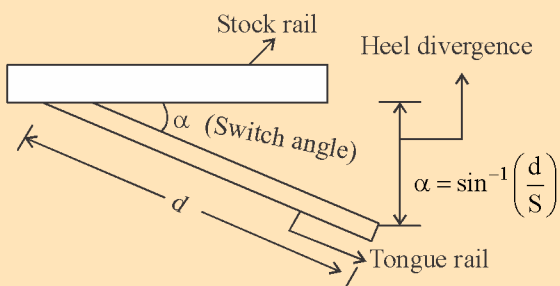
• **Ans. (b)**

51. Switch angle depends upon

i. Heel divergence
ii. Length of tongue rail
iii. Flange way clearance
iv. Throw of switch The correct answer is

(a) iii and iv (b) i and iv
(c) i and ii (d) ii and iii

• **Ans. (c)**



52. Based on 30th hourly volume, for how much percent time during the year can the designer willingly tolerate the unfavourable operating conditions ?

(a) 5.0 (b) 30
(c) 0.33 (d) 2.5

• **Ans. (c)**

Acc. to 30th hourly volume, 29-times in a year the traffic volume exceeds the design - traffic volume. in terms of percentage is given by

$$= \frac{29 \times 100}{265 \times 24} = 0.33$$

53. In a sudden contraction, the velocity head changes from 0.5 m to 1.25 m. If the coefficient of contraction is 0.66, the head loss in this contraction is

(a) 0.644 m (b) 0.648 m
(c) 0.133 m (d) 0.332 m

• **Ans. (d)**

$$h_L = \left[\frac{1}{C_c} - 1 \right]^2 \frac{V_2^2}{2g} = 0.332$$

54. Salinity of water

(a) Does not affect evaporation
(b) Increase evaporation
(c) Reduces evaporation
(d) None of the above

• **Ans. (c)**

Impurity reduces evaporation rate

55. The following surveys are conducted before the alignment of a railway track.

1. Reconnaissance survey
2. Preliminary survey
3. Traffic survey
4. Location survey

The correct sequence in which these surveys are conducted is

(a) 3, 1, 4, 2 (b) 3, 1, 2, 4
(c) 1, 3, 2, 4 (d) 1, 3, 4, 2

• **Ans. (b)**

The correct sequence of alignment of a railway track is

1. Traffic survey
2. Reconnaissance survey
3. Preliminary survey
4. Location survey

56. If ' V_0 ' is the critical velocity of flow in a channel, then according to Kennedy, its silt transporting power is proportional to

- (a) $V_0^{5/2}$ (b) $V_0^{7/2}$
(c) $V_0^{1/2}$ (d) $V_0^{3/2}$

• **Ans. (a)**

Silt transporting power is given by

$$Q = KBV^{2.5}$$

$$Q \propto V^{5/2}$$

57. Which of the following is a secondary air pollutant ?

- (a) Fly ash
(b) Smog
(c) Carbon monoxide
(d) Carbon dioxide

• **Ans. (b)**

58. The towers used in triangulation are known as

- (a) Captain McCaw
(b) Hunter
(c) Heliotropes
(d) Bilby

• **Ans. (c)**

59. Which amongst the BOD and COD of glucose water is greater ?

- (a) BOD (b) COD
(c) Both are equal (d) None of the above

• **Ans. (c)**

60. Exit gradient is directly proportional to

- (a) Creep length
(b) Seepage load
(c) Depth of cutoff
(d) None of the above

• **Ans. (c)**

Exit gradient is given by

$$G_E = \frac{H}{D} \times \frac{1}{\pi \sqrt{\lambda}}$$

61. The permissible error in chaining for measurement with chain on hilly terrain is

- (a) 1 in 500 (b) 1 in 1000
(c) 1 in 100 (d) 1 in 250

• **Ans. (d)**

rough or hilly ground = 1 in 250

ordinary chain survey = 1 in 1000

steel tape & steel band = 1 in 2000

invar tape $\approx$ 1 in 5000

62. Which of the following is NOT a method used for plane table surveying ?

- (a) Traversing method
(b) Radiation method
(c) Back scattering method
(d) Intersection method

• **Ans. (c)**

63. If a 2 % solution of sewage sample is incubated for 5 days at 20 °C and the dissolved oxygen depletion is 10 mg/L, then the BOD of the sewage would be

- (a) 500 mg (b) 2000 mg / L
(c) 50 mg/L (d) 200 mg/L

• **Ans. (a)**

Scheme of Examination : SSC-JE

Papers	Mode of Examination	Subject	Maximum Marks	Duration
Paper-I Objective Type	Computer Based Mode	General Intelligence & Reasoning	50	2 Hours
		General Awareness	50	
		General Engineering (CE, EE, ME)	100	
Paper-II Conventional Type	Written Examination	General Engineering (EE, ME, CE)	300	2 Hours

Scheme of Examination : RRB-JE

CBT-1

Name of the Sections	No. of Questions	Marks	Duration
Mathematics	30	30	90 min
General Intelligence & Reasoning	25	25	
General Awareness	15	15	
General Science	30	30	
Total	100	100	

CBT-2

Name of the Sections	No. of Questions	Marks	Duration
General Awareness	15	15	120 min
Physics & Chemistry	15	15	
Basics of Computers & Applications	10	10	
Basics of Environment & Pollution Control	10	10	
Technical Abilities	100	100	
Total	150	150	

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Civil Engineering

- Strength of Materials
- Fluid Mechanics
- Reinforced Cement concrete
- Structural Analysis
- Soil & Foundations
- Environmental Engineering
- Water Resources Engineering
- Surveying
- Transportation Engineering
- Building Materials
- Design of Steel Structure
- Estimate, Quantity, Valuation

Mechanical Engineering

- Strength of Materials
- Fluid Mechanics
- Hydraulic Machines
- Machine Design
- Thermodynamics
- Power Plant
- I C Engine
- Heat Mass Transfer
- Refrigeration & Air Conditioning
- Production Engineering
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- Theory of Machine

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Non Technical Subjects / Syllabus

- General Intelligence & Reasoning
- Maths (Only Arithmetic)
- General Awareness (Geography, Polity, History, Economics)

- Basics of Computers & Applications
- General Science (Physics, Chemistry, Biology)

- Basics of Environment & Pollution Control
- Current Affairs

Note : Syllabus will be Covered as per Examination Notifications.

64. The zero graduation in a prismatic compass is marked in the,
 (a) In the South end of the circle
 (b) In the West end of the circle
 (c) North end of the circle
 (d) In the East end of the circle
69. The pressure in " Pascals " at a depth of 1 m below the free surface of a body of water will be equal to
 (a) 981 pascal (b) 9810 Pascal
 (c) 1 Pascal (d) 98.1 Pascal

• **Ans. (a)**

65. The product of H^+ ions and OH^- ions in a stronger Alkali is

- (a) 10^{-1} (b) 10^{-14}
 (c) 0 (d) 1

• **Ans. (b)**

66. The ' track modulus ' is an index of measure of which of the following ?

- (a) Resistance due to deformation
 (b) Resistance due to rolling
 (c) Resistance due to friction
 (d) Resistance due to shear

• **Ans. (a)**

Track modulus measures the resistance to deformation. It is defined as the load (kg) per unit rail length needed to cause unit deformation in rail.

Its unit is kg/cm^2 .

67. A manhole is generally classified as a deep manhole, if its depth is more than

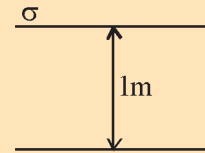
- (a) 1.5 m (b) 3.0 m
 (c) 0.6 m (d) 1.2 m

• **Ans. (a)**

68. Aerosol is known as

- (a) Diffused liquid particles
 (b) Finely divided particles of ash
 (c) Carbon particles of microscopic size
 (d) Dispersion of solid or liquid particles in air

• **Ans. (d)**



$$\Delta P = \rho gh = 1000 \times 9.81 \times 1 \\ = 9810 \text{ N/m}^2 = 9810 \text{ Pa.}$$

70. If 5 day 20°C BOD of a waste water sample is 127 mg/L, then the 8 day 20°C 12/20 the same sample is (if $K = 0.23d^{-1}$ (base e))
 (a) 162.6 mg/L (b) 166.3 mg/L
 (c) 146.3 mg/L (d) 156.3 mg/L

• **Ans. (d)**

$$\text{BOD} = L_0(1 - e^{-kt}) \\ 127 = L_0(1 - e^{-0.23 \times 5}) \\ L_0 = 185.84 \\ \text{BOD}_8 = 185.84(1 - e^{-0.23 \times 8}) \\ \text{BOD}_8 = 156.32$$

71. Recirculation in " Activated sludge process " is done to

- (a) Operate the plant continuously
 (b) Supply seed to the aeration tank
 (c) Dilute the incoming sewage
 (d) Dampen the effect of the flow variation

• **Ans. (b)**

72. The alum added as a coagulant in water treatment functions when the raw water is

- (a) Alkaline with high turbidity
 (b) Neutral with low turbidity
 (c) Acidic with high turbidity
 (d) Acidic with low turbidity

• **Ans. (a)**

73. If the length of a chord / arc is 20 m in a curve , then the relationship between R and D in the curve will be

- (a) $R = 1146 D$ (b) $R = \frac{1718.9}{D}$
 (c) $R = \frac{573}{D}$ (d) $R = \frac{1146}{D}$

• **Ans. (d)**

$$R = \frac{1146}{D} \text{ for 20m chain}$$

74. The maximum value of centrifugal ratio on roads and railways , respectively are taken as

- (a) 1/4 and 1/8 (b) 1/4 and 1/6
 (c) 1/6 and 1/8 (d) None of these above

• **Ans. (a)**

Centrifugal ratio is the ratio of centrifugal force to the weight of vehicle.

Its maximum value for roads & railways taken as 1/4 & 1/8 respectively.

75. The lost time due to starting delay on a traffic signal approach is noted to be 3 seconds . The actual green time is 25 seconds and amber time is 3 seconds . How much will be the effective green time ?

- (a) 29 sec . (b) 35 sec .
 (c) 22 sec . (d) 19 sec .

• **Ans. (c)**

Effective green time is given by

$$G_e = G + A - L$$

Where

G = Green time

A = Amber time

L = Total lost time

L = Starting delay + final last time

$$= (3 + 3) = 6 \text{ sec.}$$

($\therefore$ standing delay = final lost time = 3 sec.)

$$G_e = (25 + 3) - 6 = 22 \text{ sec.}$$

76. In GIS , interpolation is made possible by a principle called ,

- (a) Thematic auto correlation
 (b) Thematic auto - correction
 (c) Spatial auto correlation
 (d) Spatial auto - correction

• **Ans. (c)**

77. Sludge bulking can be controlled by

- (a) Aeration (b) Denitrification
 (c) Chlorination (d) Coagulation

• **Ans. (c)**

78. The camber provided on a sloping road is 1 in 48. Which one of the following is the ruling gradient ?

- (a) 1 in 24 (b) 1 in 15
 (c) 1 in 30 (d) 1 in 20

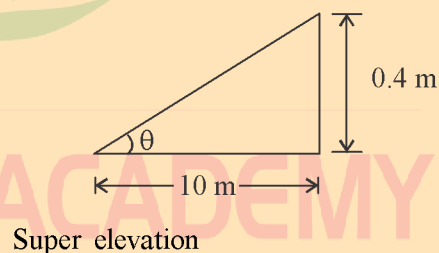
• **Ans. (a)**

$$\begin{aligned} \text{Gradient} &= 2 \times \text{Camber} \\ &= 2 \times 1/48 = 1/24 \end{aligned}$$

79. If the width of the highway is 10 m and its outer edge is 40 cm higher , the super elevation is 1 in

- (a) 25 (b) 20
 (c) 50 (d) 40

• **Ans. (a)**



$$\begin{aligned} e &= \tan \theta = \frac{0.4}{10} \\ &= \frac{1}{10/0.4} = \frac{1}{25} \\ n &= 25 \end{aligned}$$

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80. Following errors are eliminated during reciprocal levelling

- (a) errors due to line of collimation
- (b) errors due to curvature only
- (c) errors due to refraction only
- (d) error due to all above

• **Ans. (d)**

81. As per IS 10500 : 2012 , the maximum. desirable limits of iron and fluorides for drinking water are

- (a) 0.3 and 1.5 Mg / L, respectively
- (b) 0.5 1.8 Mg / L, respectively
- (c) 0.3 and 0.5 Mg / L, respectively
- (d) 0.3 and 1.0 Mg / L, respectively

• **Ans. (d)**

82. Hypsometry is a method of

- (a) finding temperature at different height
- (b) determining elevation based on the boiling point of liquids
- (c) surveying of water bodies
- (d) measuring distance

• **Ans. (b)**

83. Creep is the

- (a) lateral movement of rail
- (b) difference in level of two rails
- (c) longitudinal movement of rail
- (d) vertical movement of rail

• **Ans. (c)**

Creep in rail is defined as the longitudinal movement of the rails in the track in the direction of motion of locomotives.

84. The minimum size of grit particles that can be removed in grit chamber is

- (a) 0.20 mm (b) 0.50 mm
- (c) 0.05 mm (d) 0.10 mm

• **Ans. (a)**

85. When the recirculation ratio in a high rate trickling filter is unity , then the recirculation factor is

- (a) less than 1 (b) zero
- (c) 1 (d) more than 1

• **Ans. (d)**

$$F = \frac{1+R}{(1+0.1R)^2}$$

$$= \frac{2}{1.1^2} = \frac{2}{1.21} > 1$$

86. Bourdon gauge measures

- (a) local atmospheric pressure
- (b) standard atmospheric pressure
- (c) absolute pressure
- (d) gauge pressure

• **Ans. (d)**

87. A 4 hr . storm with a uniform intensity of 1.5 cm / hr produced a runoff depth of 40 mm . The average infiltration rate during this storm is

- (a) 6 mm / hr (b) 7 mm / hr
- (c) 4 mm / hr (d) 5 mm / hr

• **Ans. (d)**

$$\phi_{avg} = \frac{P - R}{t}$$

$$= \frac{1.5 \frac{CM}{hr} \times 4hr - 40mm}{4}$$

$$= 5mm/hr$$

88. Due to which property of mercury , it does NOT stick to glass ?

- (a) Cohesion (b) Adhesion
- (c) Viscosity (d) Surface tension

• **Ans. (a)**

89. Calculate the super elevation to be provided on the horizontal curve of radius 100 m. Design speed is 50 km / h and the design coefficient of lateral friction of 0.15 is fully developed

(a) 0.337 (b) 0.047
(c) 1.0 (d) 0.917

• **Ans. (b)**

$$e + f = \frac{V^2}{127R}$$

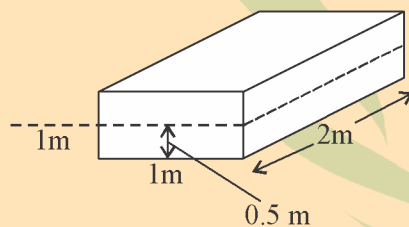
$$e + 0.15 = \frac{50^2}{127 \times 100}$$

$$e = 0.047$$

90. A rectangular block 2 m long, 1 m wide and 1m deep floats in water . The depth of immersion is 0.5 m . If water weighs 10 kN/m³. Then the weight of the block is

(a) 15 kN (b) 20 kN
(c) 5 kN (d) 10 kN

• **Ans. (d)**



$$W = F_B$$

$$W = \gamma_w V_{\text{disp}} = 10 \times 1 \times 0.5 \times 2 = 10 \text{ kN}$$

91. For analysis of direct runoff from a hydrograph the relation $N = 0.827A^{0.2}$ is used . In this , the value of area ' A ' is taken in units as

(a) Km² (b) ha²
(c) Cm² (d) m²

• **Ans. (a)**

$$N = 0.827 A^{0.2}$$

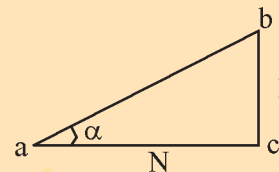
Where A = catchment area (km²)

92. Which of the following methods of designation of crossing is mostly used in India ?

(a) Isosceles angle method
(b) Centre line method
(c) Right angle method
(d) None of the above

• **Ans. (c)**

Right angle method :

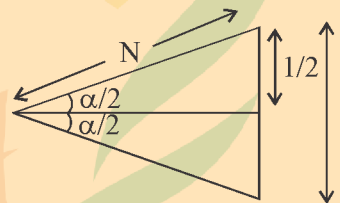


$$\tan \alpha = \frac{1}{N}$$

$$\cot \alpha = N$$

$$\alpha = \cot^{-1} (N)$$

Centre line Method :



$$\tan \left(\frac{\alpha}{2} \right) = \frac{1}{2N}$$

$$\alpha = 2 \cot^{-1} (2N)$$

93. An angle measured with theodolite is α with weight 2. The weight of $\alpha/4$ will be

(a) 2×4^2 (b) $\frac{4}{2}$
(c) $\frac{2}{4}$ (d) 2×4

• **Ans. (a)**

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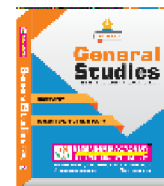
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94. Calculate the capacity (vehicle per hour) of the road when reaction time of the driver is 2 seconds. The design speed is 80 kmph and average length of the vehicle is 6 m. Take coefficient of friction is 0.35.

(a) 700 (b) 724
(c) 600 (d) 653

• **Ans. (d)**

$$\text{Capacity (Veh/hr)} = \frac{1000V}{S + L}$$

Where

V = velocity of vehicle in kmph

S = Stopping sight distance (SSD)

L = Length of vehicle

$$S = 0.278 Vt + \frac{V^2}{254f}$$

$$= 0.278 \times 80 \times 2 + \frac{80^2}{254 \times 0.35} = 116.47 \text{ m}$$

$$\text{Capacity} = \frac{1000 \times 80}{116.47 + 6} \\ \approx 653 \text{ veh/hr}$$

95. What is the relationship between the flying height (H), the focal length (f), the air base (B) and the photo base (b)?

(a) $B = \frac{b}{f.H}$ (b) $B = \frac{H}{b.f}$
(c) $B = \frac{f}{b.H}$ (d) $B = \frac{b.H}{f}$

• **Ans. (d)**

96. According to recommendations of the Nagpur Conference, the formation width of an Ideal National Highway is

(a) 09 m (b) 07.50 m
(c) 12 m (d) 13 m

• **Ans. (*)**

The formation width of an ideal national Highway taken as nearly about 7.9 m as per Nagpur conference.

97. If a turbine develops 2515 kW at 240 rpm, the torque in the shaft is

(a) 1000 kN - m (b) 100 kN - m
(c) 400 kN - m (d) 3335 kN - m

• **Ans. (b)**

$$P = \frac{2\pi NT}{60}$$

$$2515 \times 10^3 = \frac{2\pi(240) \times T}{60}$$

$$T = 100 \text{ kN-m}$$

98. If the intensity of rainfall is more than the infiltration capacity of soil, then the infiltration rate will be

(a) more than the rate of rainfall
(b) more than infiltration capacity
(c) equal to rate of rainfall
(d) equal to infiltration capacity

• **Ans. (d)**

Let Intensity of rainfall (i)

Infiltration capacity (f_p) of soil

Infiltration rate (f_t) of soil

if $i > f_p$

$\Rightarrow f_t = f_p$

99. If in a gradually varied flow dy/dx is positive, then dE/dx

(a) is always positive
(b) is always negative
(c) is negative, if $Y > Y_c$
(d) is positive if $Y/Y_c > 1$

• **Ans. (d)**

Positive if $y > y_c$

100. The time scale ratio for a model based on Froude law criterion in terms of length scale ratio L_r is

- (a) $1/\sqrt{L_r}$ (b) $L_r^{1.5}$
(c) L_r (d) $\sqrt{L_r}$

• **Ans. (d)**

$$1. \quad \frac{V_m}{\sqrt{L_m g_m}} = \frac{V_p}{\sqrt{L_p g_p}}$$

$$2. \quad \frac{V_m}{V_p} = \sqrt{\frac{L_m}{L_p}}$$

$$3. \quad \frac{L_m \times t_p}{t_m \times L_p} = \sqrt{L_r}$$

$$4. \quad \frac{L_r}{t_r} = \sqrt{L_r}$$

$$t_r = \sqrt{L_r}$$

101. What will be the theoretical maximum capacity for a single lane of highway if the speed of the traffic stream is 40 kmph ? (round off 10 units)

- (a) 2510 vehicles / hr.
(b) 2010 vehicles / hr.
(c) 3000 vehicles / hr.
(d) 2860 vehicles / hr.

• **Ans. (d)**

Theoretical maximum capacity to given by

$$C = \frac{1000V}{S}$$

Where

$$\begin{aligned} S &= 0.2 V_b + 6 \\ &= 0.2 \times 40 + 6 \\ &= 14 \text{ m} \\ &\approx 2860 \text{ Veh/hr} \end{aligned}$$

102. According to Lacey, depth of scour in a river depends upon the straightness of the reach . If ' D ' is the depth of scour in regime flow in a right angled bend, then it is equal to

- (a) 1.75 D (b) 2.00 D
(c) 1.25 D (d) 1.50 D

• **Ans. (b)**

103. The critical condition for stability of slope of an earth dam at down stream will be

- (a) Reservoir full without pore water pressure
(b) Reservoir empty with max. seepage
(c) Reservoir full with max. percolation rate
(d) None of the above

• **Ans. (c)**

104. The ratio of the quantity of water stored in the root zone of the crops to the quantity of water actually delivered in the field is known as

- (a) water use efficiency
(b) water conveyance efficiency
(c) water application efficiency
(d) none of the above

• **Ans. (c)**

$$\eta_a = \frac{V_s}{V_f}$$

Where

V_s = Volume of water stored in the root zone

V_f = Volume of water applied on the field.

105. The Bernoulli's equation is applicable only for

- (a) Inviscid , incompressible flow
(b) Compressible flow
(c) Irrotational flow
(d) Viscous flow

• **Ans. (a)**



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106. The field capacity of a soil is 25 %, its permanent wilting point is 15 % and specific dry unit weight is 1.5. If the depth of root zone of a crop is 80 cm, the storage capacity of the soil is

- (a) 12 cm (b) 14 cm
(c) 10 cm (d) 8 cm

• **Ans. (a)**

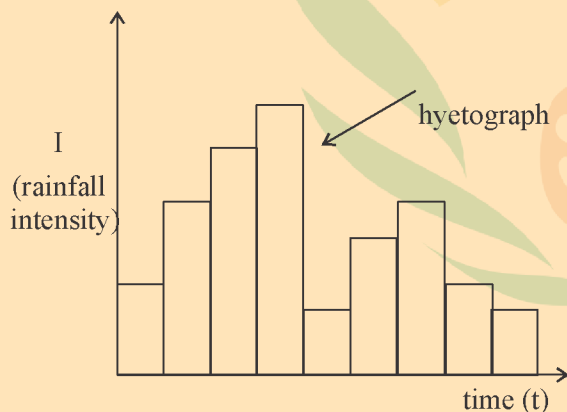
Storage capacity (d_w)

$$\begin{aligned} d_w &= \frac{y_d}{y_w} \times d \times (F.C. - PWP) \\ &= 1.5 \times 0.8 (0.25 - 0.15) \\ &= 12 \text{ cm} \end{aligned}$$

107. A hyetograph is a graphical representation of

- (a) Discharge and time
(b) Commutative rainfall and time
(c) Rainfall intensity and time
(d) Rainfall depth and time

• **Ans. (c)**



108. On a hydrograph, isolated storm is represented as

- (a) multi peaks
(b) complex peak
(c) s-curve
(d) single peak

• **Ans. (d)**

109. The similarity between the forces of model and prototype is

- (a) Kinematic similarity
(b) Design similarity
(c) Dynamic similarity
(d) Potential similarity

• **Ans. (c)**

110. An approximate value of the drag coefficient of a hemispherical parachute is

- (a) 0.30 (b) 0.07
(c) 0.35 (d) 1.33

• **Ans. (d)**

111. Surface tension for an ideal fluid is

- (a) infinite
(b) zero
(c) dependent on temperature
(d) one

• **Ans. (b)**

112. Rheology is the study of

- (a) Non - Newtonian fluids
(b) Newtonian fluids
(c) Ideal fluids
(d) None of these

• **Ans. (a)**

113. If the impeller of a pump receives liquid on both of its sides the pump is known as

- (a) Single suction pump
(b) Double suction pump
(c) Single stage pump
(d) Double stage pump

• **Ans. (b)**

114. Muskingum method of routing satisfies the equation

- (a) $C_0 \cdot C_1 \cdot C_2 = 1$
- (b) $C_0 + C_1 + C_2 = 0$
- (c) $C_0 + C_1 + C_2 = 1$
- (d) None of the above

• **Ans. (c)**

115. According to Indian standard, the number of rain gauge stations for an area of 5200 km² in plains should be

- (a) 20
- (b) 25
- (c) 10
- (d) 15

• **Ans. (c)**

In plain 1 station required per 520 km² hence
No. of rain gauge stations are

$$= \frac{5200}{520} = 10$$

116. The Buckingham - Pi theorem is widely used in the dimensional analysis and expresses the resulting equation in terms of

- (a) (n - m) dimensionless parameters
- (b) n dimensionless parameters
- (c) the repeating variables
- (d) geometric, kinematic and dynamic variables

• **Ans. (a)**

117. The water balance equation for a catchment area in terms of rainfall (P), runoff (R), evaporation (E) and storage (S) is written as

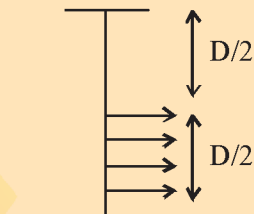
- (a) $R = E - P \pm \Delta S$
- (b) $R = E - R \pm \Delta S$
- (c) $R = P - E \pm \Delta S$
- (d) $R = P + E \pm \Delta S$

• **Ans. (c)**

118. The velocity distribution over one half of a cross section is uniform and is zero over the remaining half. The momentum correction factor for this cross section is

- (a) 1.0
- (b) 3.0
- (c) 2.0
- (d) 4.0

• **Ans. (c)**



$$\frac{O \times \frac{P}{2} + V \times \frac{D}{2}}{D} = \frac{V}{2}$$

$$\frac{1}{A} \int \frac{\mu^2 dA}{\bar{\mu}^2} = \frac{\int_0^{D/2} V^2 \cdot dx}{\left(\frac{V}{2}\right)^L \times D} = 2$$

119. A liquid flows in a 30 cm diameter pipe at a Reynolds number of 10⁶. If the friction factor is 0.025, the thickness of laminar sublayer, in mm is

- (a) 0.062
- (b) 0.0031
- (c) 0.025
- (d) 1.00

• **Ans. (a)**

$$\frac{V^* \delta'}{v} = 11.6$$

$$\frac{\bar{u} \sqrt{\frac{f}{8}} \times \delta'}{v} = 11.6$$

We know that

$$Re = \frac{\bar{u} \times D}{v}$$

$$\frac{Re}{D} = \frac{\bar{u}}{v}$$

By putting the values

$$\frac{\text{Re} \sqrt{\frac{f}{8}} \times \delta'}{D} = 11.6$$

$$\frac{10^6}{0.30} \sqrt{\frac{0.025}{8}} \times \delta' = 11.6$$

$$\delta' = 0.0000622 \text{ m}$$

$$\delta' = 0.062 \text{ mm}$$

120. With reference to lining of a canal which of the following statement is / are correct ?

- (i) It is necessary to minimise the seepage loss in canal .
- (ii) It It increases the discharge in canal section by increasing the velocity

Select the correct answer using the codes given below :

- (a) Both i and ii (b) Neither i nor ii
- (c) Only i (d) Only ii

• **Ans. (a)**

121. If the sequent depth ratio of a hydraulic jump in a rectangular channel is 16.48, the Froude number at the beginning of the jump is

- (a) 10.0 (b) 12.0
- (c) 5.0 (d) 8.0

• **Ans. (b)**

$$\frac{y_2}{y_1} = \frac{1}{2} \left[\left(\sqrt{1 + 8F_1^2} - 1 \right) \right]$$

$$16.48 = \frac{1}{2} \left[\sqrt{1 + 8F_1^2} - 1 \right]$$

$$F_1 = 12.0$$

122. A check dam is a

- (a) river training structure
- (b) water storage structure
- (c) flood control structure
- (d) soil conservation structure

• **Ans. (d)**

123. Which of the following is dimensionless ?

- (a) Specific viscosity (b) Specific gravity
- (c) Specific weight (d) Specific volume

• **Ans. (b)**

124. In a rectangular channel , if the critical depth is 2.0 m , the specific energy at critical depth is

- (a) 2.0 m (b) 2.5 m
- (c) 3.0 m (d) 1.5 m

• **Ans. (c)**

$$E_c = \frac{3}{2} y_c = 3.0 \text{ m}$$

125. In the centrifugal pumps, the Euler's head is independent of the following

- (a) Outlet velocity of triangle
- (b) Outer angular momentum
- (c) Inlet radius of impeller
- (d) Outlet radius of impeller

• **Ans. (b)**

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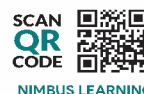
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