

- 34 Match the following:
 List-I
 P Slope deflector; method

- 36, Force in the member AB of the truss is
 a. $\frac{1}{2}$
 b. $\frac{1}{3}$



c. 1''

d. P

77 Deflection of the point C is

a. $(2J2+1)PL$ $\frac{1}{EA}$ b. $\frac{.fiPL}{Iv}$ c. $(2..E+1)~$ d. $(J2TI)~$

38 A rectangular column section of 250mm x 400mm is reinforced with 1% steel bars of grade Fe-500, each of 20mm diameter. Concrete mix is M30. Axial load on the column section, with minimum eccentricity as per IS:456-2000 using limit state method can be applied up to

a. 1107.37

b. 805.30

c. 1806.40

d. 1907.7

39. A concrete beam 61' rectangular cross section of 200mm x 400mm is prestressed with 11 force 40kN at eccentricity 100mm. The maximum compressive stress in the concrete is

a. 11.5N/mm²b. 7.5N/mm²c. 5.0N/mm²d. 3.5N/mm²

40) The flexural strength of M30 concrete as per IS:456-2000 is

a. 33 MPa

b. 5.7 MPa

c. 21.23 MPa

d. 30 MPa

41 In a random sampling procedure for cube strength of concrete, one sample consists of X number of specimens. These specimens are tested, at 28 days and average strength of these X specimens is considered as best result of the sample, provided the individual variation in the strength of specimens is not more than ± Y per cent of the average strength. The values of X and Y as per IS:456-2000 are

a. 4 and 10 respectively

b. 3 and 10 respectively

c. 4 and 15 respectively

d. 3 and 15 respectively

Different for Q.42 & Q.43 are given below. Solve the problems and choose correct answers. Assume straight line instead of parabola for stress-strain curve of concrete as given below and partial factor of safety as 1.0



A rectangular under-reinforced concrete section of 300mm width and 500mm effective depth is reinforced with 1 bars of grade Fe-500, each of 12mm diameter. Concrete mix is M20.

42. The depth of the neutral axis from the compression fibre is

a. 76mm

b. 81mm

c. 87mm

d. 100mm

43. The depth of the neutral axis obtained as per IS:456-2000 differs from the depth of neutral axis obtained in Q.12 by

a. 15mm

b. 10mm

c. 25mm

d. 32mm

44. An unsymmetrical web section is fabricated from a 10mm thick plate by fillet welds as shown in the figure. If yield stress of steel is 250MPa, the maximum shear load that section can take is

200mm

a. 750kN

b. 350 kN

c. 337.5 kN

d. 300 kN

45. A fillet welded joint of (10mm size is shown in the figure. The welded surfaces meet at 60-90 degree and permissible stress in the

mlet weld is 108 Mpa. The safe load that can be transmitted by the joint is

100mm

12..

f l

- a. 162.7 kN
- b. 151.6 kN
- c. 113.4 kN
- d. 109.5 kN

46. Which one of the following is NOT correct for steel sections as per IS 800:1984

- a. The maximum bending stress in tension or in compression in extreme fibre calculated on the effective section of a beam shall not exceed 0.66 f_y .
- b. The bearing stress in any part of a beam when calculated on the net area shall not exceed 0.75 f_y .
- a. The direct stress in compression on the gross sectional area of axially loaded compression member shall not exceed 0.6 f_y .
- d. None of the above.

47. A cantilever beam of length l , width b and depth d is loaded with a concentrated vertical load at the tip. If yielding starts at a load P , the collapse load shall be

- a. $2.0P$
- b. $1.5P$
- c. $1.2P$
- d. P

48. In a constant head permeameter with cross section area of 10 cm^2 , when the flow was taking place under a hydraulic gradient of 0.5 (the amount of water collected in 611 seconds is 600 cc). The permeability of the soil is

- a. 0.002 cm/s
- b. 0.02 cm/s
- c. 0.2 cm/s
- d. 2.0 cm/s

49. Two observation wells penetrated into a confined aquifer and located 1.5 km apart in the direction of flow. The head of 4 m and 20 m. If the coefficient of permeability of the aquifer is 30 m/day and porosity is 0.25, the time of travel of an inert tracer from one well to another is

- a. ~16.7 days
- b. 500 days
- c. 7.0 days
- d. 3000 days

50. Assuming that the river bed level does not change and the depth of water in river is 10 m, 15 m and 5 m during the months of February, July and December respectively of a particular year. The average bulk density of the soil is 20 kN/m^3 . The density of water is 10 kN/m^3 . The effective stress on a depth of 10 m below the river bed during these months would be

- a. 300 kN/m^2 in February, 50 kN/m^2 in July and 200 kN/m^2 in December
- b. 100 kN/m^2 in February, 100 kN/m^2 in July and 100 kN/m^2 in December
- c. 200 kN/m^2 in February, 250 kN/m^2 in July and 180 kN/m^2 in December
- d. 300 kN/m^2 in February, 350 kN/m^2 in July and 280 kN/m^2 in December

51. For a triaxial shear test conducted on a sand specimen at a confining pressure of 100 kN/m^2 under drained condition, the angle of shearing resistance of the soil would be

- a. 18.4°
- b. 19.47°
- c. 26.56°
- d. 30°

52. A high retaining wall is supporting a saturated sand (saturated unit weight 18 kN/m^3 and angle of shearing resistance 30°). The change in magnitude of active earth pressure at the base due to rise in ground water table from the base of the footing to the ground surface shall ($r_u = 10\text{ kN/m}^2$)

- a. increase by 20 kN/m^2
- b. decrease by 20 kN/m^2
- c. increase by 30 kN/m^2
- d. decrease by 30 kN/m^2

53. For two infinite slopes (one in dry condition and other in submerged condition) in a sand deposit having the angle of shearing resistance 30° , the factor of safety was determined as 1.5 (for both slopes). The slope angles would have been

- a. 21.05° for dry slope and 21.05° for submerged slope

- b. 19.4r 1br U1) St6pO and 18"10' ror submerged slope
 ... 18A IUJ uJ) ~IUJ" und 21.0S tUI sut"~r~ed J~Jpe
 d. 22.6 1hr dry slope and L9.41' 1lr sull.11"1god slope
- 1/ strip' tbot"1@. (8ru wide) is designed for n tullis souteml,V of 40mlh. 111e 1lafc bearing cmrcity (shear] was 150kNlm~ and sn~c aUuwnble soil P""S11il: IVA.' 10QkN11L. Due 1f unportuce ef the .1111<1[ore, now 1111f01111111:1" 1- tie red-Signed for loln Sd111~"111cl1111f25mOl. The new width Uf U10 rooting will 110
- 8m
 - Sm
 - 12m
 - 12.8 m
55. Dilling, the subsurface 1Dvest1SUI111S tor design 01' toundations; o slandard penetration test W11S conducted 11 -1.5m below the ground surtuce. The record of number "fblows i-givell below:
- | Penetration depth (cm) | Number "r~tu.... |
|------------------------|------------------|
| 0-7.5 | 3 |
| 7.5-15 | 3 |
| 15-22.5 | 1S |
| 22.5-30 | 6 |
| 31-315 | 11 |
| 37.5-45 | 7 |
- ASSuming the water table is ground level. soil as tie sand lind correction factor for overburden $\sigma \sim 1.0$. the corrected "N" vfilutor the scil would be
- 1R
 - 10
 - 21
 - 33
56. A soil muss contins 4Q% .S111vel, 5)% S11nd and 11)% silt. This ~oil can be cllssific,d as
- silly sandy c.rovel having coettlcicuf of unifornuty Jess ibU1100,
 - "ilty gravelly saud having coefficient .)1' unil;nnily "411011\ H)
 - gravelly silty sand having C)clli1lonl of 11nilonnyly greater thn 60.
 - gravelly silty stlod and Its coettlcicuf of unifornuty cM101 be determined.
57. A saturated soil mass has 11 lolal dens;," 22k11im~ and n Will-re"ntu"t (tr 1c)%. The hulk density and dry den.it~ of this soil are
- 12 kN/m³ & 20 kN/m³ respectively
 - 22 kNpJ & 20 kN/m³ respectively
 - 19.8 kN/m³ & 19.~ 111/m³ respectively
 - 23.2kN/m~ & 19.8kN/m~ respectively
58. A ~tN", function i-given by:
 $T = 2, 'y + (x + 1), '.$
 The 11,10mte across a line joining points- A(1,0) and D(0, 2)18
- O.11nil~
 - ., 1 unhs
 - 4 unL,0
 - 5 units
59. The ci,,,,1111ribn "1" around a circle of "adills 1 hols for lh. velocity 'field $u \sim 2, \dots, -Jy$ and $v \sim 2y$ ' is
- 6lr units
 - 12n units
 - 1811 uniu
 - 241<w11S
- (c0. A 11fn.kund 0 a-nac0; ur~ placed at 11 frictionless [rLiley The lank i"11-s water Jet (mass density .0f wut9r 1(0)0Lglm³, which strikes the d-11"11r and 111m. 1- ~5<>.U' 1J,~ velocity of jet leaving the deflector N "ml~ Duddischarge i. 0.j" jis, the force recorded by the spring will be
- 100N
 - 100 J2 "
 - 100) n
 - 200 J1N
61. Cross-section- of an objecl ('hvn'ng same 80011111 11111111 111 the p1f.>? submerged into a fluid c011-1st1aro :<1uolU of ~id)S, 2m :11fd triangle us .shown In the Jis" (1, 111jeollS' hinged 01 poi 1111' that is 1.0 meter below the fluid J11" surface. If the Obj~L ill-
- the k~p110
 position
 ns ~hT~1 kn
 the fis.~.
 the Ynh~ or
 -x' should
 be

- a. 5
b. 4.3
c. 4m
d. 8In
62. Critical depth of a channel of a certain width is 1.5m. The specific energy of the flow is
a. 0.7511
b. 1.0m
c. 1.511
d. Wm
113. A partially open sluice gate discharges water into a rectangular channel tail water depth in the channel is 3m and Froude number is 1.2. If free hydraulic jumps in the downstream of the sluice gate alter the velocity of the flow, the velocity of the flow in the channel should be (X) of the velocity of the flow in the channel.
a. 1)301
b. 0.401
c. 0.6901
d. 0.901
114. A triangular irrigation lined channel has a side slope of 1:1 and Manning's coefficient is 0.018. The channel depth of flow is equal to
a. 1.8m
b. 3.6201
c. 4.91m
d. 1.81m
65. If lemon juice has a pH of 3.1, the hydrogen ion concentration will be
a. 10.94×10^{-4} mol/L
b. 9.94×10^{-4} mol/L
c. 8.94×10^{-4} mol/L
d. 7.94×10^{-4} mol/L
66. List-I contains some properties of water and List-II contains some uses of water. Match List-I with List-II and select the correct answer using the codes given below the lists:
List-I
P. Surface Solid concentration
Q. Microbiology
R. Bacterial concentration
S. Coagulant dose
List-II
I. BOD
II. MPN
III. Jar test
IV. Turbidity
Codes:

	P	Q	R	S
a.	4	1	2	3
b.	2	4	1	3
c.	1	2	1	3
67. Match List-I with List-II and select the correct answer using the codes given below the lists:
List-I
P. Thickening of sludge by aeration
Q. Stabilization of sludge
R. Reducing the volume of sludge
S. Sludge
List-II
I. Decrease in volume of
II. Separation of water by
III. Digestion of sludge
IV. Separation of water by
Codes:

	P	Q	R	S
a.	4	3	1	2
b.	3	2	4	
c.			2	
d.	2	1	3	4
68. A circular primary clarifier processes an average flow of 5000 m³/d of municipal wastewater. The overflow rate is 1.35 m³/m²·d. The diameter of the clarifier is
a. 10.5m
b. 11.5m
c. 12.5m
d. 13.5m

6<) Maldl List-I with Lrst-II and ...IGOT lto correct answer using the codes gillen below the list-:

List-I

P. Release valve

Q. Check valve

R. Gate valve

S. Pilot valve

List-II

1. Reduce high inlet pressure to lower outlet pressure

2. Allow the flow of water in both directions

3. Remove air from the pipeline

4. Starting the flow of water in the pipeline.

Codes :

	P	Q	R	S
a.	J	2	3	1
b.	3	2	1	3
c.	3	4	2	1
d.	1	1	4	3

70) In a certain situation waste water discharge into a river mixes with the river water instantaneously and completely. Following is the data available:

Waste water	Discharge rate = $1.10 \text{ m}^3/\text{s}$
River water	DO = 8.5 mg/l Temperature = 20°C

The DO in the mixture of waste and river shall be

- 5.3 mg/l
- 4.51 mg/l
- 7.61 mg/l
- 8.41 mg/l

Data for Q.71 & Q.72 are given below. Sol. the problems and choose correct answers.

The city is going to install the rapid sand filter for the sedimentation tanks.

Use the following data.

Design flow rate	$20 \text{ m}^3/\text{min}$
Design filter rate	$0.5 \text{ m}^3/\text{min}$
Surface area per filter box	50 m^2

71) The surface area required for the rapid sand filter will be

- 110 m^2

b. 115 m^2

c. 111 m^2

d. 218 m^2

72) The number of filters required shall be

- 1
- 4
- 11
- 8

73) The discharge from a reservoir to a distribution system is $2 \times 10^3 \text{ l/s}$. The filter efficiency (if irrigation) or crop is 40%. If the filter depth and run period are 1.40 m and 7 weeks, respectively, the peak demand discharge is

- $2.6 \text{ m}^3/\text{s}$
- $1.63 \text{ m}^3/\text{s}$
- $8.5 \text{ m}^3/\text{s}$
- $1.5 \text{ m}^3/\text{s}$

74) Uplift of concrete points E and D (figure A) of a straight horizontal floor of thickness 150 mm. The floor is supported by two points A and B. The floor is subjected to a uniformly distributed load of 20 kN/m^2 . The uplift at points E and D are

.....

- 0.1 kN and 0.2 kN respectively
- 0.2 kN and 0.1 kN respectively
- 0.1 kN and 0.1 kN respectively
- 0.1 kN and 0.2 kN respectively

75) A sluice gate is to be designed at the downstream of a weir to discharge into a channel of $65 \text{ m}^3/\text{m}^2$. For the design of the sluice gate the scour depth is taken two times of the bed material. The factor of the bed material is unity. If the water depth is 4.4 m, the length of the sluice gate at the designed position is

- 5.5 m
- 7 m
- 5 m
- 5.5 m

Data for Q.76 & Q.77 are given below. Sol. the problems and choose correct answers.

75. A four hour unit hydrograph of a catchment is triangular in shape with a base of 50 hours. The peak of the catchment is 210 m³/s. The base flow and the initial flow are 30 m³/s. The initial flow is 30 m³/s. The initial flow is 30 m³/s. The initial flow is 30 m³/s.

76. The peak discharge of four hour unit hydrograph is
 a. 40 m³/s
 b. 50 m³/s
 c. 60 m³/s
 d. 70 m³/s

77. The peak discharge of four hour unit hydrograph is
 a. 210 m³/s
 b. 230 m³/s
 c. 260 m³/s
 d. 270 m³/s

78. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s.

79. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s.

80. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s.

81. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s.

82. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s. The peak discharge of four hour unit hydrograph is 25 m³/s.

The standard axle-load is 80 kN. The equivalent daily numbers of repetitions for the standard axle-load are

- D. 451
 b. 4 & 1
 c. 800
 d. 1200

83. A trucking company operates a scheduled daily service between city I and city Q. One-way Journey time between these two cities is 85 hours. A minimum layover time of 5 hours is to be provided at each city. How many trucks are required to provide this service?

84. A single-lane highway has a design speed of 40 kmph. The perception-brake-reaction time of drivers is 2.5 seconds and the length of vehicles is 8 m. The coefficient of longitudinal friction of the pavement is 0.15. The capacity of this road in terms of vehicles per hour per lane is
 a. 1440
 b. 750
 c. 710
 d. 600

85. A vehicle having a horizontal curve of 41 km radius. The speed of the vehicle is 100 kmph. The coefficient of lateral friction mobilized on the curve when the vehicle is travelling at 100 kmph is
 a. 0.05
 b. 0.1
 c. 0.15
 d. 0.2

86. The system of equations $AX = b$, where A is a scalar, X is a vector, and b is a scalar, has a unique solution if and only if $A \neq 0$. Let A be a $(n \times n)$ real matrix. Which one of the following statements is true?
 a. For a homogeneous system of linear equations $(A - \lambda I)x = 0$ having a non-trivial solution, the rank of $(A - \lambda I)$ is less than n .

- b. Fat matrix $A^{m \times m}$ being a positive integer, $(1^m \times X^m)$ will be the eigen-pair $\lambda = -1$.
- c. If $AT = A^{-1}$, then $|A| = 1$ for all i .
- d. If $AT = -A$, then $|A|$ is $(-1)^i$ for all i .

84. Transform the given linear form $h(x, y) = 11x^2 + 12xy + 13y^2$ into the canonical form.

$$h(x, y) = 11x^2 + 12xy + 13y^2$$

will be

$$a. \frac{1}{11}x^2 + \frac{12}{11}xy + \frac{13}{11}y^2$$

$$b. \frac{1}{11}(x-1)^2 + \frac{12}{11}(x-1)y + \frac{13}{11}y^2$$

$$c. \frac{1}{11}x^2 + \frac{12}{11}xy + \frac{13}{11}y^2$$

$$d. \frac{1}{11}(x+1)^2 + \frac{12}{11}(x+1)y + \frac{13}{11}y^2$$

85. A car starts from rest and accelerates uniformly. In 10 seconds, it covers a distance of 280 m. The mean value of the speedometer at a certain time during acceleration is read exactly

- a. 0 km/h
b. 8 km/h
c. 75 km/h
d. 126 km/h

86. The value of $\int_0^1 x^2 dx$ is

$$a. \frac{1}{3}$$

$$b. \frac{1}{4}$$

$$c. \frac{1}{5}$$

$$d. \frac{1}{6}$$

87. Value of the integral $\int_C (x^2 + y^2) dx - (x^2 - y^2) dy$, where C is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$ will be, (Use Green's theorem to change the line integral into double integral)

Here, C is the square cut from the first quadrant by the lines $x = 1$ and $y = 1$ will be, (Use Green's theorem to change the line integral into double integral)

- a. 1
b. 1
c. $\frac{3}{2}$
d. $\frac{5}{3}$

88. Consider the applicability of the Cauchy Integral Theorem to evaluate the following integral counterclockwise around the unit circle $C: |z| = 1$ see fig.

z being a complex variable, the value of I will be

a. 0

b. $-\frac{1}{2}$

$$c. \frac{1}{2}$$

d. none of these

(Note: $\int_C \frac{1}{z} dz = 2\pi i$)

None of these

Note for Q.119 & Q.90 Use given values of $\sin^{-1} x$ and $\cos^{-1} x$ to calculate the reciprocal value $\frac{1}{x}$ by using Newton Raphson Method for $f(x) = 0$.

89. The Newton-Raphson algorithm for the function $f(x) = x^2 - 2$ will be

$$a. x_{n+1} = \frac{x_n^2 + 2}{2x_n}$$

$$b. x_{n+1} = \frac{x_n^2 - 2}{2x_n}$$

$$c. x_{n+1} = \frac{x_n^2 + 2}{x_n}$$

$$d. x_{n+1} = \frac{x_n^2 - 2}{x_n}$$

90. For $x = 7$ and starting with $x_0 = 0.2$, the first two iterations will be

a. 0.11, 0.1299

b. 0.1, 0.1392

c. 0.12, 0.1428

d. 0.13, 0.1428

CIVIL ENGINEERING

ONE MARKS QUESTIONS

1. The symmetry of stress tensor at a point in a body under equilibrium is obtained from
 - a. conservation of mass
 - b. force equilibrium equations
 - c. moment equilibrium equations
 - d. conservation of energy

The components of strain tensor at a point in the plane strain case can be obtained by measuring longitudinal strain in following directions

 - a. along any two arbitrary directions
 - b. along any three arbitrary directions
 - c. along two mutually orthogonal directions
 - d. along any arbitrary direction
3. For a linear elastic frame, if stiffness matrix is doubled with respect to the existing stiffness matrix, the deflection of the resulting frame will be
 - a. twice the existing value
 - b. half the existing value
 - c. the same as existing value
 - d. indeterminate value
4. Considering a beam as axially rigid, the degree of freedom of a plane frame is
 - a. 1
 - b. 2
 - c. 3
 - d. 6
5. IS:4343-1980 gives the minimum characteristic strength of prestressed concrete for post-tensioned work and pretensioned work as
 - a. 25MPa; 30MPa respectively
 - b. 35MPa; 40MPa respectively
 - c. 40MPa; 45MPa respectively
 - d. 30MPa; 35MPa respectively
6. The safety factor of concrete as per IS:456-2000 is
 - a. 1.50
 - b. 1.15
 - c. 1.87
 - d. 1.44
7. The permissible stress in axial tension in steel member on the net effective area of the section shall not exceed if f_y is the yield stress
 - a. $0.80 f_y$
 - b. $1.75 f_y$
 - c. $11.60 f_y$
 - d. $0.50 f_y$

Root time method is used to determine

 - a. T. lime factor
 - b. coefficient of consolidation
 - c. coefficient of compressibility
 - d. coefficient of volume compressibility
11. Negative friction in a soil is considered when the pile is constructed through a
 - a. fill material
 - b. dense coarse sand
 - c. over consolidated clay
 - d. dense fine-sand
11. There are two footing testing on the ground surface. One footing is square of dimension 'B'. The other is strip footing of width 'B'. Both of them are subjected to a loading intensity of q . The pressure intensity at any depth below the base of the footing along the centre line would be
 - a. equal in both footings
 - b. large for square footing and small for strip footing
 - c. large for strip footing and small for square footing
 - d. more for strip footing than shallow depth (SB) and more for square footing at large depth (>B)
11. A soil has a maximum dry density of 17.8 kN/m^3 and optimum moisture content of 12%. A contractor during the

of core of an dam obtained, the dry density of water content is 0. This is because

- the dry density is less than the maximum dry density and water content is less than optimum
- the compaction quality is very low and water content is less than 12%
- the compaction is done on the dry side of the optimum

both the dry density and water content of the compacted soil are within the desirable limits

12. A tracer is injected continuously from a point in an unsteady flow field. The locus of locations of all the tracer particles at an instance of time represents

- Streamline
- Streakline
- Streamtube
- Streakline

13. The reading of differential manometer of a Venturimeter, placed at 'W' to the horizontal is 11 cm. If the Venturimeter is turned to horizontal position the manometer reading will be

R. Zero

h. 11 cm

c. 11 cm

J. 11 cm

- III. A horizontal bed channel is followed by a steep bed channel as shown in the figure. The gradually varied profiles over the horizontal and steep beds are

—

- R₂ and S₂ respectively
- R₂ and S₁ respectively
- H₁ and S₂ respectively
- H₁ and S₁ respectively

15. Total Kjeldahl Nitrogen is a measure of

- total organic nitrogen
- total organic and ammonia nitrogen
- total ammoniacal nitrogen
- total inorganic and ammonia nitrogen

- H). The Teu is equivalent to the OXID produced by

- 1 mg/l of chloroplatin ion
- 1 mg/l of platinum ion
- 1 mg/l platinum in form of chloroplatin ion
- 1 mg/l of pentaamminecobalt(III) ion

11. W aerobic culture, nitrosomonas. QIV-

- NH₃ to N₂
- NO₂ to NO₃
- Jim. to N₂O
- NH₄⁺ to HNO₃

11. Bulking sludge refers to having

- F/M = 0.3/d
- 0.31 d < F/M < 0.6/d
- F/M = zero
- F/M > 1/d

19. When the cutflow from a storage reservoir is uncontrolled and in free operation spillway, 1M of outflow hydrograph occurs at

- the point of intersection of the inflow and outflow hydrographs
- at the intersection of the inflow and outflow hydrographs
- the tail of inflow hydrographs
- at a point before the intersection of the inflow and outflow hydrographs

20. The intensity of rainfall and time interval of a typical storm are:

Time (minutes)	Intensity of rainfall (mm/min)
0-19	0.7
10-20	1.1
20-30	2.0
30-40	1.5
40-50	1.2
50-60	1.3
60-70	1.1
70-80	0.4

The maximum intensity of rainfall for 20 minutes duration of the storm is

- 1.1 mm/minute
- 1.5 mm/minute
- 1.3 mm/minute
- 2.0 mm/minute

11. On which of the following systems, R.O. Kulkarni, executive engineer in the Punjab Irrigation Department made

ob-ervallons for proposing Li8 theory 00
stable channel-1

- a. Krishna \Ve-t'''' Della t'nns-
- b. LAwerBad [Juab ",ma,'
- c. Lower Chenab canals
- U. Upper B3.ri D<I-bcanals

22. Which 0113 of the ruuowu'J! <I:luoIQ''
repi:enl. Lb-downstream proru'' 1) Ogee
spillway wilb vertical upstream thee') (~)
are me coordinates Of the poinl In the
downsfreau profile ,l) origin .i the crest.
of the spillWAY and "L' ,the: design head.

ii. $L = \frac{6S(\dots)}{H_r} \frac{110}{H_i}$

b. $\frac{1}{R} = 0.5 \left(\frac{2}{H_r} \right)^{1.5}$

c. $\frac{1}{H_r} = 2.0 \left(\frac{1}{H_i} \right)^{1.5}$

d. $\frac{1}{H_r} = 2.0 \left(\frac{1}{H_i} \right)^{1.5}$

23. The l-gll1-of summit CRUe- on illlvo lane
two w.3Y highway depends upon
... allowable: rate of change of oentrifugal
.00cl<:'.1100

- ll. ooaffioleOl of Dlot'' .l-fr'ction
- c. ruq.ill'ed stopping sig'lL dlsnbcb
- d. ,,quir.ill overtaking ~igll distance

- 2-1-. Pruchhllt Millllj Gram Sadek Ynj.,"
(PMGSY), launched in the year 200d,
3im-to pff)viidd rural connec'ivity with aU-
weaUler reads. It 15 P1''po~ed to cennces
ll'', hab'31.10nH in plain ucus of
pepulation more-than 500 persons by the
YOM

- a. 21)15
- h. 20(07
- c. 20 1d
- d. 2(0)2

25. L1st-l conl.lo. some prn''crii ~, of bitumen.
List-ll. giws u list of Laboratory Tests
conducted on bitumen to determine the
properliQli. M.I-h the property with the
corresponding !;oil and ~le<I the coc
answer using, the codes giv-D below the
lis",

L''l-J

P Resistance $u) D<w$

LIST-ii

- 1. Ductility test
- 2. Penetration test
- 3. FL5h and fir: poin. test

Code~ :

	P	Q	T
a.	2	1	3
b.	2	3	1
c.	1	2	3
d.	3	2	1

26. Bjl1btin''4Jj concrete IS a nih comprising
of

- a. fill' .gl,(regplc. filler and bitumen
- b. fill' agg''gnte and bitumen
- c. coarse aggregate, fine 3gg''8Dic. filler
and bitumen
- d. ooarse'gg. egate.liUer."nd biulMCl1

Pa.31''Ole fill'lor Of fP(XTY)'- I T f' wll' b.

27. ('lln-ider the m''ll'<''~ X'' .I. Y. I 11 .nd
a. (2 2)
ll. (3 3)
e. (4- 3)
d. (3 4)

28. ('onsider a nun-hoonogene()llS system of
linear equ31.iour; ''''l''cullnj
uu,'b-'1D.tic.Uy au over-determined
system, Su<11' sysl'''' will be

- 3. c(l'n-isl'n1hn'-ng~ unique solution
- D. consistent ha'ing many solutions
- c. ;no(,,'Silt;.,l h.vin8 ., uniqueSOlllllQn
- d. in-(m-illtCnlhuvlo! 11;:(llu,lon

29. Which nnc of the following is NOT' true
rur complex.number Zj aud Z,?

- a. $Z_1 = \overline{Z_2}$
- b. $17, \dots, t, S'IZd+IZ, 1$
- c. $|Z_1 - Z_2| = |Z_1| - |Z_2|$
- d. $|Z_1 + Z_2| + |Z_1 - Z_2| = 2|Z_1| + 2|Z_2|$

30. Which 01'' 01' t(f, P, llowing ~1.f<m1ents L~
Nt J'l' t-ue'l

- a. 'file measure ,l' slkwpess i-lllJlclldml
upon UIIalloult of dJ-I)CC'lij~"
- b. I r r. symmeuc distribution, the values
of mean, mode and median afo the
same
- c. I'' • positively skewed distribution,
slan ~ median ~ ota

d. $\mu < \sigma$ negatively skewed distribution.
mode > mean > median

TWO MARKS QUESTIONS

31. If principal stresses in a two-dimensional case are -10 MPa and 20 MPa respectively, then maximum shear stress is _____ MPa.
a. 10 MPa
b. 15 MPa
c. 20 MPa
d. 30 MPa
32. The bending moment diagram for a beam is given below

Q. Moment distribution method
R. Mohr's circle of three moments
S. Castigliano's second theorem
List-II

1. Force method
2. Displacement method
Codes'

	P	Q	R	S
a.	1			2
b.	1		2	2
c.	2	2		1
d.	2		2	1

35. All members of the frame shown below have the same flexural rigidity EI and length L. If a moment M is applied at joint B, the rotation of the joint is

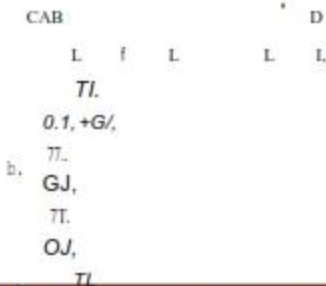
- a. $\frac{M}{12EI}$
b. $\frac{M}{16EI}$
c. $\frac{M}{14EI}$
d. $\frac{M}{7EI}$

The shear force at sections aa' and bb' respectively is of what magnitude
a. 100 kN, 150 kN
b. zero, 100 kN
c. zero, 50 kN
d. 100 kN, 100 kN

33. A circular shaft shown in the figure is subjected to torsion at two points A and B. The torsional rigidity of portions CA and BD is GJ, and that of portion AB is GJ/2. The rotation of shaft at points A and B are θ_1 and θ_2 . The rotation θ is

Data for Q. 36 & Q.37 are given below. Solve the problems and choose the correct answers.

J. Cf a t



A truss is shown in the figure. Members are of equal cross section A and same modulus of elasticity E. A vertical force P is applied at point C.

P
C