Subject Matter Test – Section -A

1. A towel, when bleached, was found to have lost 20% of its length and 10% of its breadth. The percentage of decrease in area is:
   1. 10%
   2. 10.08%
   3. 20%
   4. 28%

2. What is the unit digit in $\{(6374)^{1793} \times (625)^{317} \times (341)^{491}\}$?
   1. 0
   2. 2
   3. 3
   4. 5

3. A watch which gains 5 seconds in 3 minutes was set right at 7 a.m. In the afternoon of the same day, when the watch indicated quarter past 4 o'clock, the true time is:
   1. $59\frac{1}{11}$ min. past 3
   2. 4 pm
   3. $58\frac{1}{11}$ min. past 3
   4. $2\frac{1}{11}$ min. past 4

4. A man has Rs. 480 in the denominations of one-rupee notes, five-rupee notes and ten-rupee notes. The number of notes of each denomination is equal. What is the total number of notes that he has ?
   1. 45
   2. 60
   3. 75
   4. 90

5. Find out the wrong number in the given sequence of numbers.
   582, 605, 588, 611, 634, 617, 600
   1. 634
   2. 611
   3. 605
   4. 600

6. In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected is:
   1. 21/46
   2. 25/117
   3. 1/50
   4. 3/25

7. A boat running upstream takes 8 hours 48 minutes to cover a certain distance, while it takes 4 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water current respectively?
   1. 2 : 1
   2. 3 : 2
   3. 8 : 3
   4. Cannot be determined

8. Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30° and 45° respectively. If the lighthouse is 100 m high, the distance between the two ships is:
   1. 173 m
   2. 200 m
   3. 273 m
   4. 300 m

9. In a 500 m race, the ratio of the speeds of two contestants A and B is 3 : 4. A has a start of 140 m. Then, A wins by:
   1. 60 m
   2. 40 m
   3. 20 m
   4. 10 m

10. Insert the missing number in the following series:
    7, 26, 63, 124, 215, 342, (....)
    1. 481
    2. 511
    3. 391
    4. 421

11. Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P,Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes?
    1. 5/11
    2. 6/11
    3. 7/11
    4. 8/11

12. Study the table carefully to answer the question that follows:

Number of Pass and Fail Students, of five different classes, in a year from various schools

Schools	CLASSES									
	VI		VII		VIII		IX		X	
	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail	Pass	Fail
A	64	12	58	12	82	9	60	14	68	10
B	55	18	64	16	88	7	64	11	73	12
C	53	18	80	10	58	12	83	9	63	18
D	62	11	62	14	64	13	61	7	53	17
E	70	15	78	17	78	10	52	13	79	9
F	58	8	72	13	72	14	45	12	75	11

What is the average number of fail students from class IX from all the schools together?
   1. 19
   2. 17
   3. 13
   4. 11

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13. A group of students decided to collect as many paise from each member of group as is the number of members. If the total collection amounts to Rs. 59.29, the number of the members in the group is:

1. 57
2. 67
3. 77
4. 87

14. A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much (in fraction of vessel size) of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

1. 1/3
2. 1/4
3. 1/5
4. 1/7

15. 3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the tank in 1 day?

1. 9
2. 10
3. 11
4. 12

16. In a camp, there is a meal for 120 men or 200 children. If 150 children have taken the meal, how many men may be catered with the remaining meal?

1. 20
2. 30
3. 40
4. 50

17. A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5?

1. 4 litres, 8 litres
2. 6 litres, 6 litres
3. 5 litres, 7 litres
4. 7 litres, 5 litre

18. A train can travel 50% faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:

1. 100 km /hr
2. 110 km /hr
3. 120 km /hr
4. 130 km /hr

19. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr and the time of flight increased by 30 minutes. The duration of the flight is:

1. 1 hour
2. 2 hours
3. 3 hours
4. 4 hours

20. It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the cars is:

1. 2 : 3
2. 3 : 2
3. 3 : 4
4. 4 : 3

21. A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.

1. Rs. 1900
2. Rs. 2660
3. Rs. 2800
4. Rs. 2840

22. A and B started a business in partnership investing Rs. 20,000 and Rs. 15,000 respectively. After six months, C joined them with Rs. 20,000. What will be B's share in total profit of Rs. 25,000 earned at the end of 2 years from the starting of the business?

1. Rs. 7500
2. Rs. 9000
3. Rs. 9500
4. Rs. 10,000

23. In a triangle PQR, the length of the side QR is less than twice the length of the side PQ by 2 cm. The length of the side PR exceeds the length of the side PQ by 10 cm. The perimeter is 40 cm. The length of the smallest side of the triangle PQR is :

1. 6 cm
2. 8 cm
3. 7 cm
4. 10 cm

24. A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 sq. m, then what is the width of the road?

1. 2.91 m
2. 3 m
3. 5.82 m
4. None of these

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25. A candidate attempted 12 questions and secured full marks in all of them. If he obtained 60% marks in the test and all questions carried equal marks, then what is the number of questions in the test?

1. 36
2. 30
3. 25
4. 20

26. A cuboid has six sides of different colours. The red side is opposite to black. The blue side is adjacent to white. The brown side is adjacent to blue. The red side is face down. Which one of the following would be the opposite to brown?

1. Red
2. Black
3. White
4. Blue

27. A man fills a basket with eggs in such a way that the number of eggs added on each successive day is the same as the number already present in the basket. This way the basket gets completely filled in 24 days. After how many days the basket was ¼th filled?

1. 6
2. 12
3. 17
4. 22

28. A person traveled a distance of 50 km in 8 hours. He covered a part of the distance on foot at the rate of 4 km per hour and a part on a bicycle at the rate of 10 km per hour. How much distance (in km) did he travel on foot?

1. 10
2. 20
3. 30
4. 40

29. Six books labeled as A, B, C, D, E and F, are placed side by side. Books B, C, E and F have green covers while others have yellow covers. Books A, B and D are new while the rest are old volumes. Books A, B and C are law reports while the rest are medical extracts. Which two books are old medical extracts and have green covers?

1. B and C
2. E and F
3. C and E
4. C and F

30. Half of the villagers of a certain village have their own houses. One – fifth of the villagers cultivate paddy. One – third of the villagers are literate. Four – fifth of the villagers are below twenty five. Then, which one of the following is certainly true?

1. All the villagers who have their own houses are literate.
2. Some villagers under twenty five are literate.
3. A quarter of the villagers who have their own houses cultivate paddy.
4. Half of the villagers who cultivate paddy are literate.

31. Assume that the hour and minute hands of a clock move without jerking. The clock shows a time between 8 o'clock and 9 o'clock. The two hands of the clock are one above the other. After how many minutes (nearest integer) will the two hands be again lying one above the other?

1. 60
2. 62
3. 65
4. 67

32. "Price is not the same thing as value. Suppose that on a day the price of everything viz., coal, bread, postage stamps, a day's labour, the rent of houses, etc. were to double. Prices then would certainly rise, but values of all things except one would not." The writer wants to say that if prices of all things were doubled, then

1. The values of all things would remain constant.
2. The values of the things sold would be doubled.
3. The values of the things bought would be halved.
4. The value of money only would be halved.

33. The average temperature for Wednesday, Thursday and Friday was 40 °C. The average for Thursday, Friday and Saturday was 41°C. If temperature on Saturday was 42°C, what was the temperature on Wednesday?

1. 39° C
2. 44° C
3. 38° C
4. 41° C

34. A person has 4 coins each of different denominations, say **Rupee 1,** 2 , 5 and 10. What is the number of different sums of money the person can form (using one or more coins at a time)?

1. 6
2. 15
3. 12
4. 11

35. Find the 15th term of the sequence 20, 15, 10...

1. -45
2. -55
3. -50
4. 0

36. On what dates of April, 2001 did Wednesday fall?

1. 1st, 8th, 15th, 22nd, 29th
2. 2nd, 9th, 16th, 23rd, 30th
3. 3rd, 10th, 17th, 24th
4. 4th, 11th, 18th, 25th

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37. Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:

1. 1 : 3
2. 3 : 2
3. 3 : 4
4. None of these

39. What is the least square number of soldiers that can be drawn up in troops of 12, 15, 18 and 20 soldiers?

1. 900
2. 400
3. 1600
4. 2500

41. The average weight of 8 persons increases by 2.5 kg, when a new person comes in place of one of them, weighing 65 kg. What might be the weight of new person?

1. 76 kg
2. 76.5 kg
3. 85 kg
4. None of these

43. As per the agreement with a bank, a businessman had to refund a loan in some equal installments without interest. After paying 18 installments he found that 60 percent of his loan was refunded. How many installments were there in the agreement?

1. 22
2. 24
3. 30
4. 33

45. A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

1. 12 days
2. 15 days
3. 16 days
4. 18 days

47. Machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. All the machines are started at 9 A.M. while machine P is closed at 11 A.M. and the remaining two machines complete work. Approximately at what time will the work (to print one lakh books) be finished?

1. 11:30 A.M.
2. 12 noon
3. 12:30 P.M.
4. 1:00 P.M.

49. What will be the least number which, when doubled, will be exactly divisible by 12, 18, 21 and 30 ?

1. 196
2. 630
3. 1260
4. 2520

38. A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km/hr, what is the length of the platform?

1. 120 m
2. 240 m
3. 300 m
4. None of these

40. Find the remainder when 73*75*78*57*197*37 is divided by 34.

1. 32
2. 30
3. 15
4. 28

42. The sum of the two digits of a number is 10. If the number is subtracted from the number obtained by reversing its digits, the result is 54. Find the number?

1. 34
2. 28
3. 12
4. 17

44. A family consists of two grandparents, two parents and three grandchildren. The average age of the grandparents is 67 years, that of the parents is 35 years and that of the grandchildren is 6 years. What is the average age of the family?

1. $28\frac{1}{2}$ years
2. $31\frac{1}{2}$ years
3. $32\frac{1}{2}$ years
4. None of these

46. In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together?

1. 360
2. 480
3. 720
4. None of these

48. A, B and C start at the same time in the same direction to run around a circular stadium. A completes a round in 252 seconds, B in 308 seconds and c in 198 seconds, all starting at the same point. After what time will they again meet at the starting point ?

1. 26 minutes and 18 seconds
2. 42 minutes and 36 seconds
3. 45 minutes
4. 46 minutes and 12 seconds

50. If $3\sqrt{5} + \sqrt{125} = 17.88$, then what will be the value of $\sqrt{80} + 6\sqrt{5}$?

1. 13.41
2. 20.46
3. 21.66
4. 22.35

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Section-B

51. An equipment is purchased for Rs. 40000 and is fully depreciated by straight line method over 8 years. Considering interest on average annual cost at 15% per annum, the charge on the Company due to use of this equipment, if made uniformly over the 8 years, is
1. Rs. 5750
2. Rs. 8000
3. Rs. 8375
4. None of the above

53. Zero hardness of water is achieved by :
1. Using lime soda process
2. Excess lime treatment
3. Ion exchange method
4. Using excess alum dosage

55. The saturated and dry densities of a soil are 20 kN/m^3 and 15 kN/m^3 respectively. The water content (in %) of the soil in saturated state would be
1. 25
2. 50
3. 33.33
4. 66.66

57. A compacting factor of 0.88 for a fresh concrete sample indicates a mix of
1. High workability
2. Low workability
3. Medium workability
4. Very low workability

59. The concrete may attain its 100 percent compressive strength after
1. 28 days
2. 3 year
3. 1 year
4. 5 years

61. If an element is subjected to pure shearing stress τ_{xy}, then the maximum principal stress is equal to
1. $\frac{\tau_{xy}}{2}$
2. τ_{xy}
3. $\sqrt{1-(\tau_{xy})^2}$
4. $2\tau_{xy}$

52. The following data pertain to a sewage sample :
Initial D.O = 10 mg/l
Final D.O. = 2 mg/l Dilution to 1%
The BOD of the given sewage sample is
1. 8 mg/l
2. 10 mg/l
3. 800 mg/l
4. None of the above

54. A concrete having a slump of 70 mm is termed as
1. Dry
2. Plastic
3. Flowing
4. None of the above

56. The contribution of constituents of cement to the strength of cement is in the decreasing order
1. C_3S, C_2S, C_3A and C_4AF
2. C_2S, C_4AF, C_3S, and C_3A
3. C_2S, C_3S, C_3A and C_4AF
4. C_3S, C_3A C_2S, and C_4AF

58. In Vicat's apparatus, the cement paste is said to be of normal consistency, if the rod penetrates by
1. 3 mm
2. 23 to 25 mm
3. 5 to 10 mm
4. 33 to 35 mm

60. Total sulphur content of cement is less than
1. 0.025 %
2. 2.5 %
3. 0.25 %
4. 5.0 %

62. A thin cylindrical shell of diameter 'd', length 'l' and thickness 't' is subjected to internal pressure p. Poisson's ratio of the material is μ. The ratio of longitudinal strain to hoop strain is :
1. $\frac{pd}{2t}$
2. $\left(\frac{\mu-2}{2\mu-1}\right)$
3. $\frac{pd}{2t}(1-\mu)$
4. $\left(\frac{2\mu-1}{\mu-2}\right)$

63. When the diameter of circular section is doubled, its radius of gyration is
1. Reduced to half
2. Doubled
3. Increased by 8 times
4. Increased by 3 times

64. Following compounds can be used as accelerators except
1. $CaCl_2$
2. NaCl
3. $CaSO_4$
4. Na_2SO_4

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65. According to Darcy's law for flow through porous media, the velocity is proportional to
1. Effective stress
2. Hydraulic gradient
3. Cohesion
4. Stability number

66. The BOD removal efficiency, in percentage, during primary treatmet under normal conditions is about :
1. 65%
2. 85%
3. 30%
4. None of the above

67. Hyetograph is a graph representing
1. Rainfall volume with time
2. Rainfall intensity with time
3. Rainfall intensity with duration
4. Rainfall intensity over an area

68. A bull nose brick is not used for
1. Rounding off sharp corners
2. Pillars
3. Decoration purpose
4. Arches

69. For filling cracks in masonry structures, the type of bitumen used, is
1. Cut-back bitumen
2. Bitumen-emulsion
3. Blown bitumen
4. Plastic bitumen.

70. In a tilted aerial photograph, if the swing is 230°, then the rotation angle is equal to :
1. 140°
2. 130°
3. 50°
4. 25°

71. In a tree, the cambium layer is situated between:
1. The outer bark and inner bark
2. The inner bark and sap wood
3. The sap wood and heart wood
4. The pith and heart wood

72. A turn-table on railways is used for
1. Preventing the lateral movement of wheels
2. Reversing the direction of the engine
3. Reducing the damage to the rails
4. None of the above

73. The depreciation charges for a machine are thirty paise per working hour. The machine has a scrap value of Rs 2000 and a working hour average life of 24000 hours. What is the purchase price of the machine?
1. Rs. 1800
2. Rs. 7200
3. Rs. 9200
4. None of the above

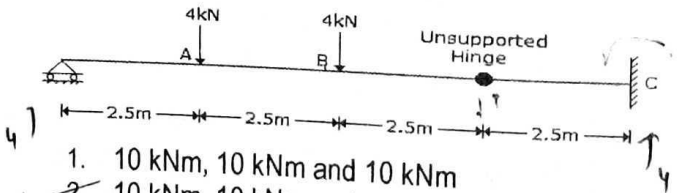
74. A parabolic arch, symmetrical, with hinges at centre and ends, carries a point load P at distance x from left support. The arch has a span of 20 m and rise of 5 m. What is the value of x if the left hinge reaction is inclined with a slope of two vertical on one horizontal?
1. 8 m
2. 5 m
3. 4 m
4. None of the above

75. Shear strength of timber depends on which one of the following?
1. Lignin with fibres
2. Medullary rays
3. Heartwood
4. Sapwood

76. In standard penetration test, the splitspoon sampler is penetrated into the soil stratum by giving blows from a drop weight whose weight (in kg) and free fall (in cm) are, respectively,
1. 30 and 60
2. 60 and 30
3. 65 and 75
4. None of the above

77. Two closed thin vessels, one cylindrical and the other spherical with equal internal diameter and wall thickness are subjected to equal internal fluid pressure. The ratio of hoop stresses in the cylindrical to that of spherical vessels is
1. 4.0
2. 2.0
3. 1.0
4. 0.5

78. The bending moments at point A, B, and C of the beam shown in the given figure will be:



1. 10 kNm, 10 kNm and 10 kNm
2. 10 kNm, 10 kNm and - 10 kNm
3. 20 kNm, 10 kNm and - 10 kNm
4. 10 kNm, - 10 kNm and 20 kNm

79. In a chute spillway, the flow is usually
1. Uniform
2. Critical
3. Sub-critical
4. Super-critical

80. The main function of a fish plate is
1. To join the two rails together
2. To allow the rail to expand and contract freely
3. To join the rails with the sleeper
4. None of the above

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81. In a steady radial flow into an intake, the velocity is found to vary as $(1/r^2)$, where r is the radial distance. The acceleration of the flow is proportional to

1. $1/r^5$
2. $1/r^3$
3. $1/r^4$
4. None of the above

82. Negative skin friction in a soil is considered when the pile is constructed through a

1. Fill material
2. Dense coarse sand
3. Over consolidated stiff clay
4. None of the above

83. A hydraulic turbine has a discharge of 5 m^3/s, when operating under a head of 20 m with a speed of 500 rpm. If it is to operate under a head of 15 m, for the same discharge, the rotational speed in rpm will approximately be

1. 433
2. 403
3. 627
4. None of the above

84. Principle involved in the relationship between submerged unit weight and saturated weight of a soil is based on

1. Equilibrium of floating bodies
2. Archimedes' principle
3. Stokes' law
4. D. Darcy's law

85. The peak discharge of the instantaneous unit hydrograph of a basin, when compared to the peak discharge of a 4-hour unit hydrograph of that basin, would be

1. Greater
2. Equal
3. Lesser
4. None of the above

86. The reaction time for calculation of stopping distance may be assumed as

1. 5.0 second
2. 2.5 second
3. 0.5 second
4. 10.0 second

87. The repeating variables in dimensional analysis should:

1. Include the dependent variable
2. Have amongst themselves all the basic dimensions
3. Be derivable from one another
4. None of the above

88. The length of Summit Curve on a two lane two way highway depends upon

1. Allowable rate of change of centrifugal acceleration
2. Coefficient of lateral friction
3. Required Stopping Sight Distance
4. Required Overtaking Sight Distance

89. An important purpose of prime coats is to:

1. Promote the bond between the base and the wearing courses
2. Promote the adhesion between an existing wearing surface and a subsequent wearing surface
3. Promote the bond between the sub-base cause and the sub-grade
4. Increase the stability of the sub-gradedd

90. The problem of lateral buckling can arise only in those steel beams which have

1. Moment of inertia about the bending axis larger than the other
2. Moment of inertia about the bending axis smaller than the other
3. Fully supported compression flange
4. None of the above

91. The most important water quality parameter for domestic use of water is

1. Carbonate hardness
2. Non-carbonate hardness
3. Coliform group of organisms
4. Chlorides

92. In using the data from a plate bearing test for determining the modulus of subgrade reaction, the value of settlement to be used is :

1. 1.25 mm
2. 2.50 mm
3. 3.75 mm
4. None of the above

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93. The carry over factor in a prismatic member whose far end is hinged is

1. zero
2. 3/4
3. ½
4. 1

95. The moment required to rotate the near end of a prismatic beam of length 'L' through a unit angle without translation, the far end being simply supported, is given by
(Where EI is the flexural rigidity of beam)

1. 3EI/L
2. 2EI/L
3. 4EI/L
4. EI/L

97. The equilibrium super elevation to be provided on a curve of radius R meters and speed of vehicle V kmph is given by

1. $GV^2/127R$
2. $GV^2/147R$
3. $GV^2/160R$
4. $GV^2/217R$

99. The detention period in coagulation tanks is usually kept as

1. 1 to 2 minutes
2. 2 to 6 hours
3. 30 to 45 minutes
4. None of the above

101. For a given grade of steel, the limiting reinforcement index for a singly reinformced beam is proportional to

1. f_{ck}
2. f_y
3. f_y/f_{ck}
4. f_{ck}/f_y

103. Bending moment at any section in a conjugate beam gives in the actual beam

1. Slope
2. Deflection
3. Curvature
4. Bending moment

105. A sample of cement is said to be sound when it does not contain free

1. Lime
2. Iron oxide
3. Silica
4. Alumina

94. Sensitiveness of a level tube is designated by

1. Radius of level tube
2. Length of bubble of level tube
3. Length of level tube
4. None of the above

96. A steel rod of length 'L' and diameter 'd' fixed at both ends, is uniformly heated to a temperature rise of ΔT. The modulus of elasticity of material is 'E' and Thermal expansion coefficient is 'α'. Thermal stress in rod is :

1. zero
2. $E\alpha\Delta T$
3. $\alpha\Delta T$
4. $E\alpha\Delta TL$

98. If a multijet Pelton turbine has 'n' number of jets, then its specific speed is directly proportional to

1. n^0
2. $n^{3/4}$
3. $n^{1/2}$
4. n

100. Which of the following methods of structural analysis is a force method

1. Slope deflection method
2. Moment distribution method
3. Three moment equation
4. None of the above

102. If the staff intercept on a staff located at 100 m from the level for five division deviation of the bubble is 0.050 m and if the length of one division of the bubble is 2 mm, then the radius of curvature of the bubble is 0.050 m and if the length of one division of the bubble is 2 mm, then the radius of curvature of the bubble tube is

1. 2.02 m
2. 2.20 m
3. 20.00 m
4. None of the above

104. The water stored in the reservoir below the minimum pool level is called

1. Useful storage
2. Valley storage
3. Dead storage
4. Surcharge storage

106. In a fillet weld, the weakest section is the

1. Smaller side of the weld
2. Side perpendicular to force
3. Throat of the fillet
4. Side parallel to force

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107. A simply supported beam has parabolic loading with maximum intensity 'w' at its centre, the maximum S.F. in the beam is equal to
1. wL/2
2. wL/4
3. wL/3
4. w

108. During a CBR test, the load sustained by a remoulded soil specimen at 5.0 mm penetration is 60 kg. The CBR value of the soil will be
1. 10.0%
2. 5.25%
3. 2.92%
4. 2.43%

109. The shear force in a beam subjected to pure bending is
1. Positive
2. Negative
3. Zero
4. None of the above

110. What is the slope correction for a length of 20.0 m along a gradient of (1 vertical and 20 horizontal)
1. 2.5 cm
2. 0.375 cm
3. 25.5 cm
4. 0.0375 cm

111. If the declination is 5°40' W, which one of the following magnetic bearing would represent the true bearing of S 25°20'E?
1. S 19°20'E
2. S 19°20'W
3. S 31°0'E
4. S 29°0'E

112. A solid shaft can resist a bending moment of 3.0 kN-m and a twisting moment of 4.0 kN-m together, then the maximum torque that can be applied is
1. 7.0 kN-m
2. 4.5 kN-m
3. 3.5 kN-m
4. 5.0 kN-m

113. If L is the length of transition curve and R is the radius of circular curve, then the shift of the curve is directly proportional to
1. R and $1/L^2$
2. $1/R^2$ and L
3. 1/R and L^2
4. R^2 and 1/L

114. A shaft is subjected to maximum compressive stress of 20 N/mm² and maximum shear stress of 80 N/mm² due to torque. The maximum induced tensile stress is
1. 70 N/mm²
2. 50 N/mm²
3. 60 N/mm²
4. 140 N/mm²

115. A circular shaft subjected to torsion undergoes a twist of 1° in a length of 120 cm. if maximum shear stress induced is limited to 1000 kg/cm² and modulus of rigidity =0.8x10⁶ kg/cm², then the radius of the shaft should be
1. π/18
2. 18/π
3. π/27
4. 27/π

116. A 6 h storm with hourly rainfall intensities of 7,18,25,17,11 and 6 mm/h produces a run off of 39 mm. Then Φ - index is
1. 3 mm/h
2. 7.5 mm/h
3. 8 mm/h
4. 10 mm/h

117. The kern of a circular cross-section of radius R is a concentric circular area with a radius of
1. R/3
2. R/6
3. R/4
4. R/8

118. For engineering materials, Poisson's ratio lies between
1. 0 and 1
2. -0.5 and +0.5
3. -1 and +1
4. 0 and 0.5

119. Expected project duration generally follows
1. Normal distribution curve
2. Poisson's distribution curve
3. β-distribution curve
4. None of the above

120. Polyvinyl Chloride (PVC) is a
1. Thermosetting material
2. Elasto-plastic material
3. Thermoplastic material
4. Rigid plastic material

121. The stress at which a material fractures under large number of reversal of stress is called
1. Endurance limit
2. Ultimate strength
3. Creep
4. Residual stress

122. The method of plane tabling commonly used for establishing the instrument station is a method of
1. Radiation
2. Resection
3. Intersection
4. Traversing

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123. The minimum value of friction factor that can be occur in laminar flow through a circular pipe is

1. 0.025
2. 0.064
3. 0
4. 0.032

124. A triangular notch is more accurate measuring device than a rectangular notch

1. For low flow rates
2. For medium flow rates
3. For high flow rates
4. For all flow rates

125. What is the most common cause of the acidity in water?

1. Carbon mono oxide
2. Hydrogen
3. Nitrogen
4. Carbon dioxide

126. In fluid flow, the line of constant piezometric head passes through two points which have the same

1. Elevation
2. Velocity
3. Pressure
4. Velocity potential

127. The rate of loading applied in crushing strength test is

1. 10 tonne/minute
2. 40 tonne/minute
3. 20 tonne/minute
4. 400 tonne/minute

128. The allowable maximum water content in bitumen should not be

1. Less than 0.2% by weight
2. More than 0.2% by weight
3. Less than 0.4% by weight
4. More than 0.4% by weight

129. In a water treatment plant, dissolved iron and manganese can be removed by

1. Aeration
2. Aeration and flocculation
3. Aeration and coagulation
4. Aeration and sedimentation

130. If the specific gravity of a suspended particle is increased from 2 to 3. The settling velocity will

1. Not change
2. Get 1.5 times
3. Get doubled
4. Get 2.25 times

131. Penetration test on bitumen is used for determining its

1. Grade
2. Ductility
3. Viscosity
4. Specific gravity

132. What type of noise can be abated by providing lining on walls and ceiling with sound absorbing material

1. Source noise
2. Structural noise
3. Reflection noise
4. Air borne noise

133. If the radius of wheel load distribution is 30 cm and the slab thickness is 15 cm, then the equivalent radius of resisting section is

1. 29.56 cm
2. 30 cm
3. 39.68 cm
4. 15 cm

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

1. 1
2. Infinite
3. 100
4. Zero

135. If average distance headway is 25 m, then the basic capacity of a traffic lane at speed of 60 km/h is

1. 2820 vehicles/h
2. 1500 vehicles/h
3. 2400 vehicles/h
4. 1000 vehicles/h

136. If coefficient of lateral friction is 0.15 and super elevation rate is zero, then safe travelling speed of a vehicle on the horizontal curve of radius 153 m will be

1. 15 m/sec
2. 13 m/sec
3. 12 m/sec
4. 10 m/sec

137. The consistency and flow resistance of bitumen can be determined from which of the following?

1. Ductility test
2. Softening point test
3. Penetration test
4. Viscosity test

138. The maximum design gradient for vertical profile of a road is

1. Ruling gradient
2. Exceptional gradient
3. Limiting gradient
4. Minimum gradient

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139. In the theory of plastic bending of beams, the ratio of plastic moment to yield moment is called

1. Shape factor
2. Modulus of resistance
3. Plastic section modulus
4. Rigidity modulus

141. The ultimate bearing capacity and unit weight of soil are 300 kN/m² and 20 kN/m³ respectively. The depth of foundation is 1 m, factor of safety is 2.5, the net safe bearing capacity is

1. 100 kN/m²
2. 80 kN/m²
3. 112 kN/m²
4. 100.5 kN/m²

143. The natural void ratio of a saturated clay strata, 3 m thick is 0.9. the final void ratio of the clay at the end of consolidation is expected to be 0.71 m. The total consolidation settlement of the clay strata is

1. 30 cm
2. 20 cm
3. 25 cm
4. 15 cm

145. Undrained shear strength C_u of a saturated clay tested in unconfined compression is given in terms of unconfined compressive strength q_u as

1. $C_u = 0.5\ q_u$
2. $C_u = q_u$
3. $C_u = 0.66\ q_u$
4. $C_u = 2\ q_u$

147. A direct shear test was conducted on a cohesionless soil specimen under a normal stress of 200 kN/m². The specimen failed at a shear stress of 200 kN/m². The angle of internal friction of the soil is

1. 45°
2. 30°
3. 60°
4. 75°

149. Time scale ratio for a model based on Froude's law criteria in terms of length scale ratio L_r is

1. L_r
2. $\sqrt{L_r}$
3. $\frac{1}{\sqrt{L_r}}$
4. $L_r^{1.5}$

151. An oil of kinematic viscosity 0.25 stokes flows through a pipe of diameter 10 cm. The flow is critical at a velocity of

1. 7.2 m/s
2. 0.5 m/s
3. 5.0 m/s
4. 0.72 m/s

140. In Mohr's diagram, a point above Mohr's envelope indicates

1. Imaginary condition
2. Imminent failure condition
3. Safe condition
4. Condition of maximum obliquity

142. In a cohesionless soil deposit with a unit weight of 15 kN/m² and an angle of internal friction of 30°, the active and passive earth pressures (in kN/m²) at a depth of 10 m will be, respectively :

1. 150 and 50
2. 100 and 200
3. 50 and 450
4. 200 and 100

144. When movement of a wall under the earth pressures from backfill was prevented, the coefficient of earth pressure was recorded as 0.5. The ratio of the coefficient of passive and active earth pressure of the back fill

1. 1/3
2. 1/9
3. 3
4. 9

146. A soil has liquid limit of 60%, plastic limit of 35% and shrinkage limit of 20% and it has a natural moisture content of 50%. The liquidity index of the soil is

1. 1.5
2. 0.6
3. 1.25
4. 0.4

148. A square pile of section 30 cm x 30 cm and length of 10 m penetrates a deposit of clay having cohesion 'C' =5 kN/m² and mobilizing factor 'α'=0.8. Load carried by pile by skin friction only?

1. 192 kN
2. 48 kN
3. 37.7 kN
4. 60kN

150. At the location of a plastic hinge

1. Radius of curvature is infinite
2. Moment is infinite
3. Curvature is infinite
4. Flexible stress is infinite

152. Corresponding to a pressure head of 8 m of water column, height of kerosene (specific gravity = 0.8) column will be?

1. 12.5 m
2. 10 m
3. 6.17 m
4. 1.25 m

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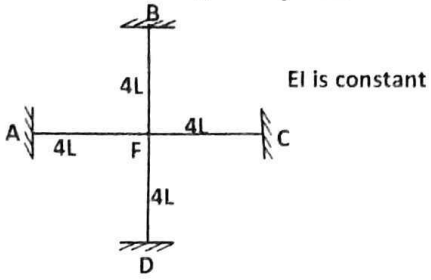
153. Distribution factor for BE in given figure is

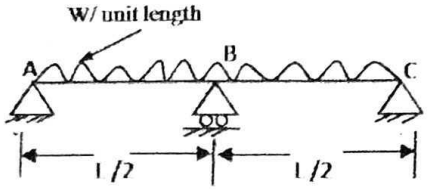


1. 1/4
2. 1.24
3. 3/13
4. 0.4

154. The factored moment of resistance of a singly reinforced concrete beam of width 220 mm is 145 kN-m. The effective depth of beam is nearly equal to (Use M 20 grade of concrete and Fe 415 grade of steel)

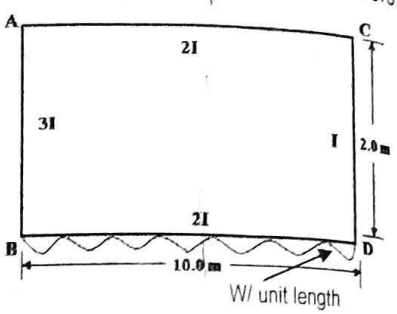
1. 720 mm
2. 488 mm
3. 640 mm
4. 380 mm

155. For the beam shown below, the reaction at support B



1. $\frac{3WL}{8}$
2. $\frac{WL}{6}$
3. $\frac{5WL}{8}$
4. $\frac{WL}{4}$

156. For the box section, the distribution factor for members AB and AC are



1. 1/2, 1/2
2. 2/17, 15/17
3. 15/17, 2/17
4. 1/3, 2/3

157. The most efficient section for a given beam for a given cross-sectional area is

1. Circular
2. Channel
3. Hollow circular
4. I-section

158. Which of the following system is suitable for pre-tensioning of the members

1. Freyssinet system
2. Gifford-udal system
3. Lee-Me call system
4. Hoyer system

159. For a fixed beam with length L, having plastic moment capacity of M_p, the ultimate central concentrated will be

1. $\frac{4M_p}{L}$
2. $\frac{6M_p}{L}$
3. $\frac{M_p}{8L}$
4. $\frac{8M_p}{L}$

160. The profile of a tendon is parabolic with a central dip 'h'. Effective prestressing force is 'P' and the span is 'L'. What is the equivalent upward acting uniform load?

1. $\frac{8hL}{P}$
2. $\frac{8h^2L}{P}$
3. $\frac{8hP}{L^2}$
4. $\frac{8hP}{L}$

161. Web crippling occurs due to

1. Column action of web
2. Excessive bending moment
3. Failure of web under points load
4. Secondary bending moment

162. Consistency as applied to cohesive soils is an indicator of its

1. Density
2. Shear strength
3. Moisture content
4. Porosity

163. Which one of the following condition has to be satisfied for both elastic and plastic method of analysis of indeterminate structures?

1. Yield condition
2. Equilibrium condition
3. Mechanism condition
4. Compatibility condition

164. A soil has shrinkage limit of 10% and specific gravity of soil solids as 2.7. The void ratio of the soil at shrinkage limit is

1. 21.2%
2. 73%
3. 27%
4. 78.8%

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165. Side face reinforcement is provided in a beam when the depth of web exceeds
1. 300 mm
2. 500 mm
3. 450 mm
4. 750 mm

166. Identify the correct statement which corresponds to accelerator: retarder
1. $CaCl_2$: $CaSO_4$
2. NaOH; KOH
3. NaCl: $CaCl_2$
4. KOH: NaOH

167. Minimum clear cover (in mm) to the main steel bars in slab, beam, column and footing respectively are
1. 10,15,20,25
2. 20,25,30,40
3. 15,25,40,75
4. 20,35,40,75

168. The flexural stresses at top and bottom of a T-section of 30 cm depth are 50 N/mm² and 150 N/mm². The neutral axis from the top will be
1. 7.5 cm
2. 22.5 cm
3. 15.5 cm
4. 25.5 cm

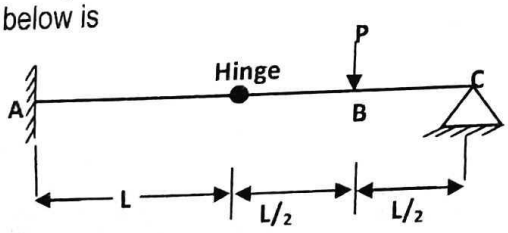
169. A cantilever beam 50 mm wide and 150 mm deep having length 4m is failed by applying a force of 15 kN at the free end. The bending stress at the failure is given by
1. 480 N/mm²
2. 160 N/mm²
3. 320 N/mm²
4. zero

170. At a point in a strained material, if two mutually perpendicula tensile stresses of 200 N/mm² and 100 N/mm² are acting then the intensity of tangential stress on a plane inclined a 45° to the axis of the minor stress will be
1. 100 N/mm²
2. 75 N/mm²
3. 50 N/mm²
4. 125 N/mm²

171. The width of the strongest beam of rectangular sections that can be cut from a cylindrical log of diameter 40 cm, would be
1. 10.41 cm
2. 23.09 cm
3. 16.19 cm
4. 27.53 cm

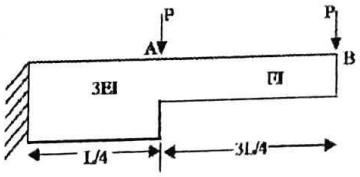
172. A cantilever beam carries a concentrated load W at its free end acts upward. The deflection at mid span of beam will be
1. $\frac{7WL^3}{48EI}$
2. $\frac{WL^3}{6EI}$
3. $\frac{11WL^3}{48EI}$
4. $\frac{WL^3}{3EI}$

173. The bending moment at point A of beam as shown below is



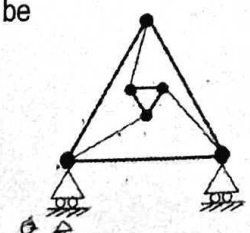
1. zero
2. $\frac{3PL}{2}$
3. $\frac{PL}{2}$
4. 2PL

174. The cantilever beam shown in figure has load P acting at points A and B. The deflection at B is Δ, when the load at B is removed. When the load at A is removed, the deflection at A will be



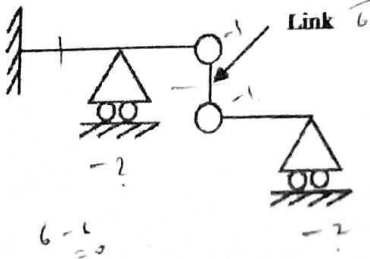
1. Δ/4
2. 2Δ/3
3. Δ/2
4. Δ

175. The degree of static indeterminacy for the beam as shown in figure will be



1. 0
2. 2
3. 1
4. 3

176. The degree of static indeterminacy for the beam as shown in figure will be



1. 0
2. 1
3. 2
4. 3

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