ZONE TECH

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Best Institute For Assistant & Junior Engineer

Civil Engineering

Full Length Paper - 12

RSMSSB - JE Test Series

Answer key & Detailed Solution

Test ID. 123 **Date:- 07/09/2021**

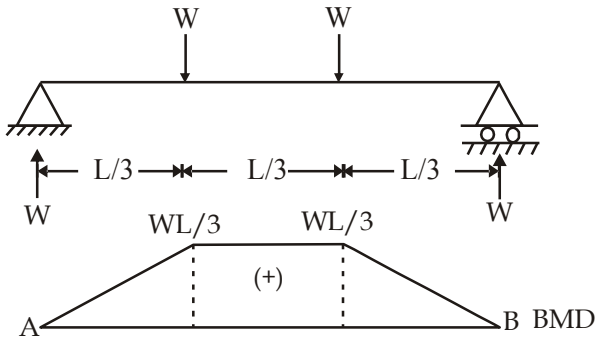
Duration : 2:00 hr. **Maximum Marks : 120**

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(c)	(d)	(a)	(b)	(a)	(a)	(c)	(a)	(d)	(c)
11.	**12.**	**13.**	**14.**	**15.**	**16.**	**17.**	**18.**	**19.**	**20.**
(c)	(b)	(d)	(d)	(b)	(c)	(d)	(b)	(a)	(b)
21.	**22.**	**23.**	**24.**	**25.**	**26.**	**27.**	**28.**	**29.**	**30.**
(a)	(d)	(c)	(b)	(c)	(b)	(a)	(d)	(d)	(d)
31.	**32.**	**33.**	**34.**	**35.**	**36.**	**37.**	**38.**	**39.**	**40.**
(d)	(d)	(a)	(d)	(c)	(b)	(a)	(b)	(b)	(a)
41.	**42.**	**43.**	**44.**	**45.**	**46.**	**47.**	**48.**	**49.**	**50.**
(a)	(c)	(b)	(a)	(c)	(d)	(d)	(a)	(b)	(d)
51.	**52.**	**53.**	**54.**	**55.**	**56.**	**57.**	**58.**	**59.**	**60.**
(c)	(a)	(c)	(b)	(c)	(b)	(d)	(c)	(c)	(b)
61.	**62.**	**63.**	**64.**	**65.**	**66.**	**67.**	**68.**	**69.**	**70.**
(c)	(b)	(c)	(c)	(c)	(a)	(c)	(d)	(c)	(b)
71.	**72.**	**73.**	**74.**	**75.**	**76.**	**77.**	**78.**	**79.**	**80.**
(a)	(b)	(a)	(a)	(d)	(b)	(d)	(a)	(d)	(c)
81.	**82.**	**83.**	**84.**	**85.**	**86.**	**87.**	**88.**	**89.**	**90.**
(a)	(b)	(d)	(b)	(b)	(c)	(d)	(c)	(c)	(a)
91.	**92.**	**93.**	**94.**	**95.**	**96.**	**97.**	**98.**	**99.**	**100.**
(b)	(c)	(c)	(a)	(d)	(d)	(b)	(c)	(b)	(d)
101.	**102.**	**103.**	**104.**	**105.**	**106.**	**107.**	**108.**	**109.**	**110.**
(b)	(b)	(b)	(d)	(a)	(d)	(b)	(c)	(b)	(b)
111.	**112.**	**113.**	**114.**	**115.**	**116.**	**117.**	**118.**	**119.**	**120.**
(a)	(a)	(b)	(d)	(c)	(b)	(d)	(d)	(d)	(d)

41. (a)

$$\because \quad K = \frac{\Delta P}{\left(-\frac{\Delta V}{V}\right)} = \frac{(2-1)}{-\frac{(995-1000)}{1000}}$$

43. (b)



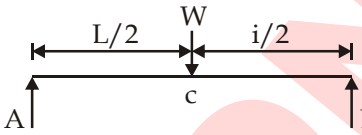
By symmetry

$$R_A = R_B = W$$

$$BM_{max} = \frac{WL}{3}$$

45. (c)

Sol.



Max. deflection - $\frac{WL^3}{48EI}$

Max. Slope - $\frac{WL^2}{16EI}$

46. (d)

for rectangular c/s beam, maximum shear force is given as, $\tau_{max} = \frac{3}{2}\frac{V}{bd}$

$$4 = \frac{3}{2} \times \frac{60 \times 10^3}{100 \times d}$$

$$t = 225 \text{ mm}$$

47. (d)

$\because$ Beams are loaded with uniformly distributed load so bending moment, $M \propto l^2$

$$\Rightarrow \quad \frac{M_1}{M_2} = \left(\frac{l_1}{l_2}\right)^2$$

Also beams have equal cross section and same support conditions.

$$\Rightarrow \quad \sigma = \frac{M}{z} \Rightarrow \sigma \propto M$$

$$\Rightarrow \quad \frac{\sigma_1}{\sigma_2} = \left(\frac{l_1}{l_2}\right)^2$$

$\Rightarrow$ given as, $l_1 = 2l, l_2 = l$

$$\Rightarrow \quad \frac{\sigma_1}{\sigma_2} = \left(\frac{2l}{l}\right)^2 = 4$$

49. (b)

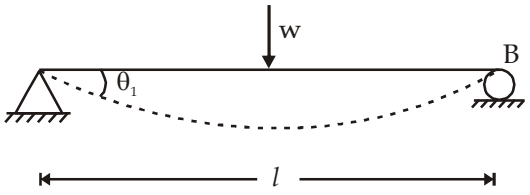
No. of equation required = 3

$$\Sigma F_x = 0$$

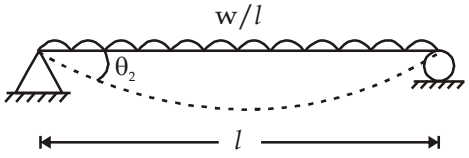
$$\Sigma F_y = 0$$

$$\Sigma M_z = 0$$

53. (c)



$$\theta_1 = \frac{wl^2}{16EI}$$



$$\theta_2 = \frac{\left(\frac{w}{l}\right).l^3}{24EI}$$

$$\Rightarrow \quad \frac{\theta_1}{\theta_2} = \frac{3}{2} = \frac{1.5}{1}$$

54. (b)

Efficiency of sprinkler irrigation varies according to climate conditions; 60% in warm climate, 70% in moderate climate and 80% in humid or cool climate.

55. (c)

Sol. Lacey's scour depth $D = 0.47\left(\frac{Q}{f}\right)^{1/3}$

57. (d)

Diversion head work live weir or barrage is constructed across a perennial river to raise water level and to divert the water to canal.

58. (c)

Average depth of Rainfall over the catchment

$$= \frac{\varepsilon P_i A_i}{\varepsilon A_i} = \frac{6\times100 + 8\times200 + 10\times200}{100+200+200} = 8.4 \text{ cm}$$

60. (b)

IS 456 : 2000 clause No. 37.1

61. (c)

The idea of strong column-weak beam concept is to prevent total collapse of the building while resisting the lateral loads (especially the seismic loads/EQ).

62. (b)

IS 456 : 2000 clause No. 26.2.3

66. (a)

According to IS 875. The live load for sloping roof with slopes greater than 10° is adopted as 0.75 kN/m² less 0.02 kN/m² for every degree increases in slope over 10° subjected to minimum of 0.40 kN/m² . In our case slope is 15°.

Hence,

Live load = 0.75 – 5 × 0.02

= 0.65 kN/m²

72. (b)

For 33 grade cement :- IS 269

43 grade cement :- IS 8112

53 grage cement :- IS 12269

74. (a)

$$\tau = C + \sigma\tan\phi$$

$C = 0 \rightarrow$ cohesionless soils

$\tan\phi = \tan 38° = 0.781$

$$\text{So, } \tau = \sigma\times0.781 \Rightarrow \frac{\tau}{\sigma} = 0.781$$

75. (d)

$C_c = 1,\ C_u = 4$

$$C_u = \frac{D_{60}}{D_{10}} = 4 \Rightarrow D_{60} = D_{10}$$

$$C_c = \frac{(D_{30})^2}{D_{60}\times D_{10}} \Rightarrow 1 = \frac{(D_{30})^2}{D_{10}\times D_{10}}$$

$$\Rightarrow \frac{D_{30}}{D_{10}} = 2$$

76. (b)

IS : 3101 – Aluminium collapsible tubes.

IS : 3102 – Classification of burnt clay brick

IS : 3495 – Method of test of burnt clay brick

IS : 3496 – Specification for dobby lags and pegs.

77. (d)

Oxalic powder mixed with water to create dilute oxalic acid solution is used to polish mosaic floors.

79. (d)

Dry rot is a special form of decay in timber caused by fungus which reduces the wood to powdery condition. Decomposition and putrefaction is accompanied by evolution of gases, mainly hydrogen sulphide and carbon dioxide. Lack of ventilation aides the growth of this fungus.

80. (c)

Correct × Correct = Wrong × Wrong

= 2380 × 20 = 20.2 × X

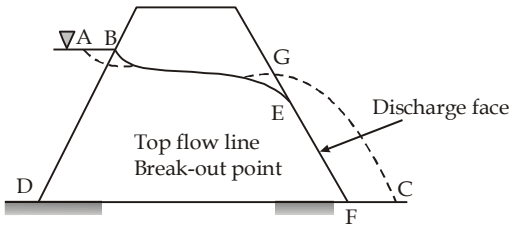
X = 2403.8

Error = measured value – true value

= 2380 – 2403.8 = – 23.8

Correction = –error = –(–23.8) = 23.8 Ans

81. (a)



For an earth dam will seepage through dam, top flow line BE is Cozney parabola and it is called Phreatic line.

Upstream face BD is the equipotential line because total head is same at all points along it.

Downstream toe (F) is the focus of the base parabola.

82. (b)

Drainage conditions affect rate of settlement. Other parameters (thickness; initial void ratio; over-burden pressure) affect the total settlement.

83. (d)

For unconfined shear test on cohesive soil the all round pressure $\sigma_3 = 0$. So Mohr's circle will pass through origin.

84. (b)

$$\text{Corrected area} = A' = \frac{A_0}{(1-\epsilon)} = \frac{15}{1-0.25}$$

$$= 20\text{cm}^2$$

85. (b)

When the water table is at ground level, the surcharge depth D_f and soil below foundation base will be submerged. Thus minimum bearing capacity will occur for this condition.

87. (d)

The permissible tensile stress in concrete on water face (MPa).

Stress	Grade of Concrete			
	M 20	M 25	M 30	M 35
Direct tension	1.2	1.3	1.5	1.6
Bending tension	1.7	1.8	2	2.2

88. (c)

Check for lateral stability - (clause 23.3).

For a cantilever, the clear distance from the free end of the cantilever to the lateral restraint shall not exceed 25b or $100b^2/d$ whichever is less as per given data, b = 150mm d = 500 mm and L = 4m.

89. (c)

Check for lateral stability - (clause 23.3).

For a cantilever, the clear distance from the free end of the cantilever to the lateral restraint shall not exceed 25b or $100b^2/d$ whichever is less as per given data, b = 150mm d = 500 mm and L = 4m.

$$L \not> \begin{cases} 25b = 25\times150 = 3750mm \\ \dfrac{100b^2}{d} = \dfrac{100\times150^2}{500} = 4500mm \end{cases}$$

$$\Rightarrow \quad L \not> 3750 \text{ mm}$$

but L is 4000 mm. so given beam fails in lateral deflection limits, for cantilever (span upto 10 m)

Check for deflection - Clause (23.2.1)

Span to effective depth ratio ≤ 7

For given conditions, $\dfrac{span}{depth} = \dfrac{4000}{500} = 8$

as, $\dfrac{span}{depth} > 7$

$\Rightarrow$ beam also not satisfying the deflection criteria.

$\therefore$ Beam will fail in both deflection and lateral stability.

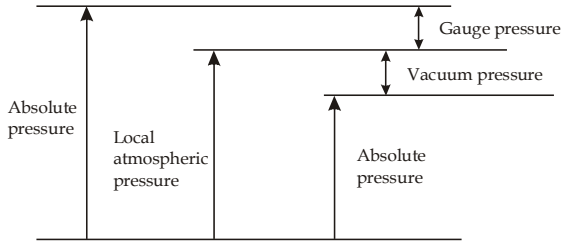
91. (b)

$I_{xx} = I_{yy}$ is available in (b) only thereby giving the maximum value of $r_{min.}$

92. (c)

In the case of compression, there is no need to deduct hole area from the section to compute strength

96. (d)



97. (b)

For three dimensional steady incompressible flow the continuity equation is

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0$$

or $$\frac{\partial}{\partial x}\left(-\frac{\partial \phi}{\partial x}\right)+\frac{\partial}{\partial y}\left(-\frac{\partial \phi}{\partial y}\right)+\frac{\partial}{\partial z}\left(-\frac{\partial \phi}{\partial z}\right)=0$$

or $$\frac{\partial^2 \phi}{\partial x^2}+\frac{\partial^2 \phi}{\partial y^2}+\frac{\partial^2 \phi}{\partial z^2}=0$$

Which is nothing but $\Delta^2\phi = 0$. The "Laplace equation". Thus any function that satisfied Laplace equation is a possible case of fluid flow.

100. (d)

$$\text{Number of divisions } n = \frac{\text{Main scale L.C.}}{\text{Combined L.C.}}$$

$$= \frac{0.5}{0.05} = 10$$

102. (b)

Mean sea level (MSL) is used as a reference surface for establishing the vertical control.

103. (b)

Thiessen Polygon Method: In this method the rainfall recorded at each station is given a weightage on the basis of an area closest to the station.

$$P_{avg} = \frac{P_1A_1 + P_2A_2 + ...P_nA_n}{A_1 + A_2 + ... + A_n}$$

where, P_1, P_2, ... P_n are the rainfall data of areas A_1, A_2, ...A_n.

The Thiessen-polygon method of calculating the average precipitation over an area is superior to the arithmetic average method.

104. (d)

$$\epsilon_V = \frac{3\sigma}{E}(1-2\mu) = 0 \text{ for } \mu = 0.50$$

105. (a)

If the zeros of the verniers A and B are not at the ends of the same diameter and exactly 180° apart, the error occurs. In that case the difference between the two vernier readings will be constant but slightly different from 180°. The error can be eliminated by taking the readings of both the verniers and taking the mean of the two readings. It may be noted that if the vernier is eccentric, no error is introduced in the angle so long as the same vernier is used for the initial and final reading. It is clear from the above discussion that by taking the mean of the two vernier readings, the error due to eccentricity of the centres and that due to eccentricity of verniers both are eliminated.

106. (d)

NSL is above the top of the bank, the canal section will have to be cut, and it shall be called "canal in cutting".

NSL is lower than the CBL, the canal section will have to be built in filling and it is called "canal in filling" (Bank).

109. (b)

Water hammer	-	Sudden closure of valve
Cavitation	-	Vapour pressure
Rise of sap in tree	-	Capillarity
Spherical shape of rainwater drop	-	Surface tension

110. (b)

The center of pressure is the point on a body where the total sum of a pressure field acts, causing a force and no moment about that point.

111. (a)

When adhesion force is more than cohesion force then fluid will wet the surface and angle of contact between fluid and surface will be less than 90° (acute).

112. (a)

$$\text{Efficiency} = \frac{\text{Net output head}}{\text{Input head}} = \frac{H-h}{H}$$

113. (b)

$$SAR = \frac{Na^+}{\sqrt{\frac{Ca^{2+}+Mg^{2+}}{2}}}$$

$$= \frac{20}{\sqrt{\frac{3+1}{2}}} = \frac{20}{\sqrt{2}}$$

$$= \frac{20}{1.414} = 14.14$$

SAR lies between 10 to 18 so it is medium sodium water.