



# ZONE TECH

Best Institute For Assistant & Junior Engineer

## Civil Engineering

Full Length Paper - 10

RSMSSB JE Test Series

Answer key & Detailed Solution

Test ID. 121

Date:- 02/09/2021

Duration : 2:00 hr.

Maximum Marks : 120

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

11. (a)

राजस्थान का सर्वाधिक पशुधन (घटते हुए क्रम में) – बकरी (37.95%), > गौवंश > भैंस > भेड़ > ऊँट।

14. (c)

मृतप्रायः इस कला को पुनर्जीवित करने का श्रेय कृपालसिंह शेखावत को जाता है जिन्होंने ब्लू पॉटरी को एक विश्व आयाम दिया।

16. (b)

कालीबंगा : यहाँ सरस्वती व दृषद्वती नदियों की घाटियों में हड़प्पाकालीन विकसित सभ्यता के अवशेष प्राप्त हुए हैं। इन नदियों का वर्तमान स्वरूप घग्घर नदी है।

25. (a)

मेवाड़ प्रजामण्डल—

- माणिक्य लाल वर्मा के प्रयासों से स्थापित (24 अप्रैल, 1938)।
- अध्यक्ष—बलवंत सिंह मेहता व उपाध्यक्ष भूरेलाल बया को बनाया गया। महामंत्री माणिक्यलाल वर्मा बने।

26. (d)

बेगूँ किसान आन्दोलन के दौरान 13 जुलाई, 1923 ई. को गोविन्दपुरा में किसानों के सम्मेलन पर सरकार ने गोलियाँ चलवाई जिससे रूपाजी और कृपाजी नामक दो किसान मारे गये।

29. (c)

विद्वानों की ऐसी मान्यता है। कि कथक नृत्य की 'हिन्दू शैली' का प्रतिनिधित्व 'जयपुर घराना' ही करता है। जयपुर घराना कथक नृत्य शैली का आदिम घराना माना जाता है। जयपुर घराने के कथक नृत्य में हाव-भाव, संगीत, मुद्राएँ सभी सरल और ग्राहा होती हैं। जयपुर घराने की वंश-परम्परा पाँच शाखाओं के रूप में पृथक-पृथक गाँव के व्यक्तियों के नाम से विकसित हुई। इन्हीं पाँचों शाखाओं के कथकों को 'जयपुर घराना' के नाम से जाना जाता है। प्रथम शाखा—नायक नत्थूलाल, द्वितीय शाखा—गिरधारी लाल, तृतीय शाखा—शंकरलाल, बट्टीप्रसाद, चतुर्थ शाखा—पूर्णराम, पंचम शाखा—भानुजी।

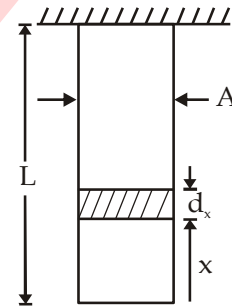
31. (c)

मेड़ता में जन्में कल्लाजी की चित्तौड़गढ़ जिले में विशेष मान्यता है। चित्तौड़ के तीसरे साके में अकबर के विरुद्ध लड़ते हुए ये वीरगति को प्राप्त हुए। युद्धभूमि में चतुर्भुज के रूप में दिखाई गई वीरता के कारण इनकी ख्याति चार हाथ वाले लोक देवता के रूप में हुई। इन्हें नागराज का अवतार माना जाता है।

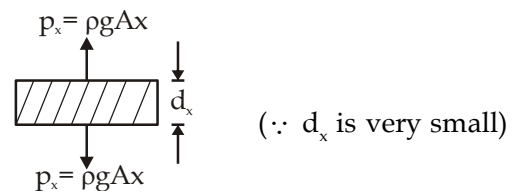
33. (b)

निडरी नवमी : सर्पों के आक्रमण से बचने के लिए श्रावण नवमी को नेवलों की पूजा की जाती है जिसे निडरी नवमी कहते हैं।

41. (a)



Let a segment of length ' $d_x$ ' situated at ' $x$ ' distance above free end



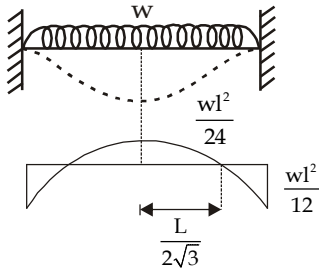
∴ Elongation of ' $d_x$ ' segment dueto

$$'p_x' (d\Delta) = \frac{p_x \cdot d_x}{AE}$$

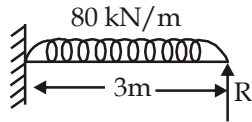
$$\text{Axial elongation of bar } (\Delta) = \int_0^L \frac{(\rho g A x) dx}{AE}$$

$$\Rightarrow \Delta = \frac{\rho g L^2}{2E}$$

43. (c)



44. (b)



Deflection

$$\delta = 0$$

$$\delta = \delta_{UDL} - \delta_R$$

$$\delta = \frac{PL^4}{8EI} - \frac{RL^3}{3EI}$$

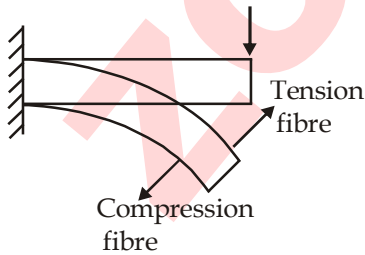
$$\Rightarrow \frac{PL}{8} - \frac{R}{3} = 0$$

$$\Rightarrow \frac{80 \times 3}{8} - \frac{R}{3} = 0$$

$$\Rightarrow \frac{R}{3} = 30$$

$$R = 90 \text{ KN}$$

45. (d)



$$\text{Stress} \Rightarrow f = \frac{M}{I} \times y$$

since  $M_{\max}$  at support  
and tension at top fibre.

So  $f_{\max}$  at support & top fibre.

46. (c)

$$\therefore \frac{\tau}{r} = \frac{T}{J} = \frac{G\theta}{L} \Rightarrow \frac{T}{\theta} = \frac{GJ}{L}$$

$\therefore \frac{GJ}{L}$  is called torsional stiffness.

$$\Rightarrow \text{Torsional stiffness} = \frac{M_t}{\phi}$$

( $\therefore$  Here  $T = M_t$  &  $\theta = \phi$ )

47. (a)

$$\text{Stiffness (k)} = \frac{w}{\Delta} = \frac{Gd^4}{8D^3n} \Rightarrow k \propto d^4$$

$$\frac{k_N}{k_M} = \left(\frac{d_N}{d_M}\right)^4 = \left(\frac{d_N}{2d_N}\right)^4 = \frac{1}{16}$$

$$\Rightarrow k_N = \frac{k_M}{16}$$

48. (c)

Slenderness ratio,

$$\lambda = \frac{l_{\text{eff}}}{r} = 160$$

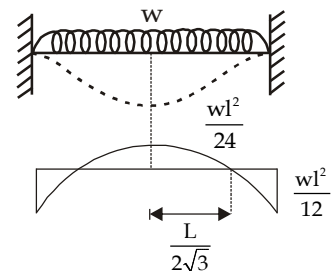
$\therefore$  Both ends are hinged,  $l_{\text{eff}} = l$

$$r = \sqrt{\frac{I}{A}} = \sqrt{\frac{(\pi d^4 / 64)}{(\pi d^2 / 4)}} = \frac{d}{4}$$

$$\Rightarrow \frac{l}{(d/4)} = 160$$

$$\Rightarrow \frac{l}{d} = \frac{160}{4} = 40$$

49. (d)

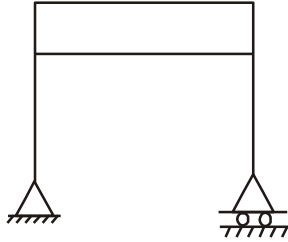


$$\Rightarrow \frac{WL^2}{\frac{WL^2}{24}} = 24$$

50. (b)

Three moment equation is used for determination of unknown moments and forces in statically indeterminate beams.

51. (c)



Static indeterminacy of 2-D Rigid frame,

$$D_s = 3m + r_e - 3j - r_r$$

where  $m$  = no. of members = 6

$r_e$  = total external reactions = 3

$j$  = no. of joints = 6

$r_r$  = released reaction = 0

$$\Rightarrow D_s = 3 \times 6 + 3 - 3 \times 6 - 0$$

$$D_s = 3$$

52. (c)

$$M_{bc} = M_{fbc} + \frac{2EI}{L} \left( 2\theta_b + \theta_c - \frac{3\Delta}{L} \right)$$

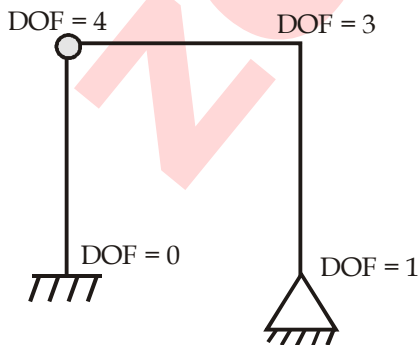
$\therefore$  No loading at span 'bc', so  $M_{fbc} = 0$

$$\Delta = 0, L = 8 \text{ m}$$

$$\Rightarrow M_{bc} = 0 + \frac{2(2EI)}{8} (2\theta_b + \theta_c - 0)$$

$$\Rightarrow M_{bc} = 0.5EI (2\theta_b + \theta_c)$$

53. (c)



$$\text{Total DOF} = 0 + 4 + 3 + 1$$

$$\text{KI} = 8$$

$$\text{or } D_k = 3j - R_e + r_r = 3 \times 4 - 5 + 1 = 8$$

55. (b)

Sol. Condition for no tension is  $\sigma_{\min} = 0$

$$\frac{P}{A} - \frac{M}{Z} = 0$$

$$\frac{P}{A} = \frac{M}{Z}$$

$$\frac{P}{\frac{\pi}{4} D^2} = \frac{Pe}{\frac{\pi}{32} D^3}$$

$$\therefore e = \frac{D}{8}$$

$$\therefore \text{Diameter of core} = 2 \times \frac{D}{8} = \frac{D}{4} = 0.25D$$

56. (a)

Oven drying method is more accurate method because in this method temperature remains in control.

58. (c)

$$w = \frac{W_w}{W_d} \times 100 = \frac{W - W_d}{W_d} \times 100$$

$$W = 320 - 260 = 60$$

$$W_d = 310 - 260 = 50$$

$$w = \frac{60 - 50}{50} \times 100 = 20\%$$

59. (a)

Wet sieving is a procedure used to evaluate particle size distribution or gradation of a granular material. It's also used to prepare a granular material for particle size analysis by removing fines that may impede the separation process. It is based on Stokes's law.

60. (c)

According to IS 1498 : 1970

Liquid Limit	Plasticity Index	Shrinkage Index	Free Swell	Degree of Expansion
20 - 35	< 12	< 15	< 50	Low
35 - 50	12 - 23	15 - 30	50 - 100	Medium
50 - 70	23 - 32	30 - 60	100 - 200	High
70 - 90	> 32	> 60	> 200	Very high

61. (b)

$$S_Y + S_R = n$$

$$n = \text{Porosity}$$

$$S_Y = n - S_R$$

So specific yield is always less than porosity

62. (a)

Compaction is a process of rearrangement of soil particles by dynamic pressure in which air is decreased from the soil. In this whole process  $S < 1$ .

63. (c)

Determination of coefficient of consolidation  
 Several methods are available for obtaining  $C_v$   
 These methods compare characteristic features of the theoretical time factor,  $T$ , and the degree of consolidation,  $U$ , relationship with time-compression data obtained in the laboratory.  
 The square root of time-fitting method (root  $t$  method) proposed by Taylor (1948) and the logarithm of time-fitting method (log  $t$  method), also called casagrande's method, are the most widely used methods in practice and are considered as standard methods.

64. (c)

$$C = 50 \text{ kPa}$$

$$\text{Shear strength } q = 2C$$

$$q = 2 \times 50 = 100 \text{ kPa}$$

65. (b)

Grade of Steel	$x_{u \max} / d$
Fe 250	0.53
Fe 415	0.48
Fe 500	0.46

66. (d)

Grade of Concrete	Grades
Ordinary concrete	M10 to M20
Standard concrete	M25 to M55
High strength concrete	M60 to M80

**Note:** IS 456 : 2000 specifies 7 grades of standard concrete (M25 to M55) whereas revised ammendment of IS 456 : 2000

(Ammendment, may 2013) specifies 8 grades of standard concrete (M25 to M60).

67. (a)

The concept of locating neutral axis in a reinforced concrete flexural member as centroidal axis is applicable in working stress method but not in limit state method. Because WSM assumes that concrete is elastic and bond between steel & concrete is perfect within elastic limit of steel.

68. (d)

Angle of bend	Anchorage value
45°	4φ
(Standard bend) 90°	8φ
135°	12φ
(Standard hook) 180°	16φ

69. (a)

$$\text{Development length } (L_d) = \frac{0.87f_y \phi}{4\tau_{bd}}$$

70. (c)

IS-456 permits maximum 30% redistribution of moments in statically indeterminate beams. Clause no 37.1.1

71. (b)

Flat slab is called flat plate if drop and column head are omitted and span of slab is not large and also loads are not excessive.

72. (a)

$$e_{\min} = \text{greater of } \begin{cases} \frac{L}{500} + \frac{D}{30} = \frac{3000}{500} + \frac{300}{30} = 16 \text{ mm} \\ 20 \text{ mm} \end{cases}$$

$$= 20 \text{ mm}$$

73. (d) Vegetation will cause problem of oxidation due to presence of organic matter that's why formation of cracks take place which reduces the net area so load carrying capacity decreases and due to cracks environmental impacts is also increases which leads decay of stones.
74. (c) Tri-calcium aluminate is reacts very fast with after and may lead to immediate stiffening of the paste. This process is known as flash set. Gypsum is added to cement to prevent such a fast reaction.
75. (b) The specification for Lime for Whitewash shall conform to IS 712 : 1984 as given below.  
Classification  
Building limes shall be classified as follows.  
Class A - Eminently hydraulic lime used for structural purposes.  
Class B - Semi-hydraulic lime used for masonry mortars, lime concrete and plaster undercoat.  
Class C - Fatlime used for finishing coat in plastering, whitewashing, composite mortars, etc.
77. (b) As per IS 1200  
**Surface Dressing :-**  
Trimming of natural ground, excavated surface and filled up area to remove vegetation and/or small inequalities not exceeding 150 mm deep shall be described as surface dressing and measured in square metres.  
**Rough Excavation :-**  
Excavation not requiring dressing of sides and bottom and reduction to exact levels, such as winning earth from borrow pits, hillside cutting, etc. shall be described as rough excavation and measured in cubic metres  
**Surface Excavation :-**  
Excavation exceeding 1.5 m in width as well as 10 m<sup>2</sup> on plan but not exceeding 300 mm in depth shall be described as 'surface excavation' and measured in square metres.  
**Excavation Over Area :-**  
Excavation exceeding 1.5 m in width as well as 10 m<sup>2</sup> on plan, and 300 mm in depth shall be described as excavation over areas and measured in cubic metres
80. (b) The horizontal distance between the vertical joints in successive courses is termed as lap in brick masonry and for a good bond it should be one fourth of the length of a brick.
81. (a) Rolled steel tubes are referred by their outer diameter.
82. (b) Stress lemination in fatigue:  
  - The maximum (absolute) value of the normal and shear stresses shall never exceed the elastic limit ( $f_y, \tau_y$ ) for the material under cyclic loading.
  - The maximum stress range shall not exceed  $1.5f_y$  for normal stresses and  $1.5f_y/\sqrt{3}$  for the shear stress under any circumstance.
83. (c) Gusset plates are subjected to direct, flexural and shear stresses.
85. (b) As per IS 12843 : 1989 table no. 1
87. (d) Purlins are place at the panel so as to avoid bending moment in rafter.
91. (a)
$$P = \rho gh$$

$$0.15 \times 10^6 = 1000 \times 9.81 \times h$$

$$h = \frac{0.15 \times 10^6}{1000 \times 9.81}$$

$$h = 15.2 \text{ m}$$
93. (d) Potential function  

$$\phi = \frac{m}{2\pi} \ln r$$
94. (d) When at rest energy = mgh  
and falling through the height h  

$$mgh = \frac{1}{2} mv^2$$

$$v^2 = 2 gh \quad \Rightarrow v = \sqrt{2gh}$$

96. (c)

Given for pipe flow  
 Reynold's number = 640  
 So flow is laminar  
 we can apply

$$f = \frac{64}{Re} = \frac{64}{640} = 0.1$$

98. (a)

To plot or draw a map or plan accuracy required is also define by the scale of the plan. A good draftmen can plot smallest length of 0.25 mm. Now for a scale of 1/1000 (1 mm = 1m) smallest plottable distance is 0.25 mm hence for survey done at a scale of (1 : 1000) should have field accuracy of 0.25 mm.

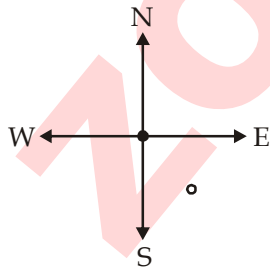
100. (d)

A blunder (or gross error) is a significant, unpredictable mistake caused by human error that often leads to large discrepancies. Blunders are typically the result of carelessness, miscommunication, fatigue, or poor judgment. Examples of common blunders are :- Improperly leveling the surveying instrument.

102. (c)

$\Sigma L_S > \Sigma L_N$  so point will be in southern

$\Sigma D_E > \Sigma D_W$  so point will be in eastern



So closing line will lie in S-E quadrant.

105. (a)

The length of time for water flow in furrows will be shorter for sandy soils which have high permeability.

106. (c)

Independent equations that form the lacey's regime theory

(i)  $v = \left( \frac{Qf^2}{140} \right)^{1/6}$  m/sec

(ii)  $R = \frac{5 v^2}{2 f}$  or  $P = 4.75 \sqrt{Q}$

(iii)  $S = \frac{f^{5/3}}{3340 Q^{1/6}}$

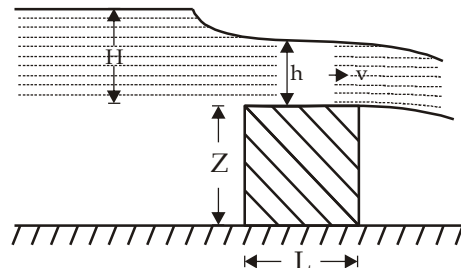
107. (b)

By providing stone pitching on concave side maximum surface area will covered.

108. (d)

Field channel mens the canal off taking from any of the main canal or branch or secondary canal or distributary or sub-secondary canal or any water course that supplies water to each field upto the area of 10 hectares.

109. (c)



Broad-crested weir

For maximum discharge

$$h = \frac{2}{3} H$$

112. (c)

Due to urbanization, infiltration capacity decreases of catchment area hence run-off increases also time to peak discharge decreases and base period of hydrograph decreases. Peak discharge of hydrograph also increases.