Answer-key & Solution

AE-Civil
MOCK -(13)
Date 10 / 9 / 2017

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

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 9560620353*

Note : *If you face any problem regarding result or marks scored, please contact : 9313111777*

SOLUTION (AE Civil) MOCK TEST no. 13

1. B Let the two numbers be A and B.

$A + B = 18$

$A^2 + B^2 = 256$

$(A + B)^2 = A^2 + B^2 + 2AB$

$\Rightarrow (18)^2 = 256 + 2AB$

$\Rightarrow 324 = 256 + 2AB$

$\Rightarrow 2AB = 68$

$\Rightarrow AB = 34$

$\therefore$ The product of two numbers = **34**

2. A Let r be the radius $4\pi (r + 2)^2 - 4\pi r^2 = 792$

$$\Rightarrow (r + 2)^2 - r^2 = \frac{792}{4\pi}$$

$$\Rightarrow r^2 + 4r + 4 - r^2$$

$$= \frac{792 \times 7}{4 \times 22} = 63$$

$\Rightarrow 4r = 63 - 4 = 59$

$\Rightarrow r = 14.75$ m

$\therefore$ Required radius = **14.75 m**

3. C $\sin 3A = \cos (A - 56°)$

$\Rightarrow \cos (90° - 3A) = \cos(A - 56°)$

$\Rightarrow 90° - 3A = A - 56°$

$\Rightarrow 90° + 56° = 3A + A$

$\Rightarrow 4A = 146°$

$$\Rightarrow A = \frac{146}{4} = \mathbf{36.5°}$$

4. D Ist person $\rightarrow 6$ — 4

IInd person $\rightarrow 8$ — 24 — 3

I + II + Boy $\rightarrow 3$ — 8

$$\therefore \text{Share of Boy} = \frac{1}{8} \times 5000 = ₹\ \mathbf{625}$$

5. B Let the sum be P.

$$\therefore 1015 = P\left[\left(1 + \frac{3}{100}\right)^2 - 1\right]$$

$$\left[\because C.I. = P\left[\left(1 + \frac{r}{100}\right)^n - 1\right]\right]$$

$$\Rightarrow 1015 = P\left[\left(\frac{103}{100}\right)^2 - 1\right]$$

$$\Rightarrow 1015 = P\left(\frac{10609 - 10000}{10000}\right)$$

$$\Rightarrow P = ₹\ \frac{1015 \times 10000}{609}$$

$$= ₹\ \frac{10150000}{609}$$

$$\therefore \text{S.I.} = \frac{10150000 \times 2 \times 3}{609 \times 100} = ₹\ \mathbf{1000}$$

6. C We know that,

$l = a + (n - 1)d$ → common Diff.

last term; first term; no. of terms

Here,

$l = 7875$ (The number nearer to 8000 which is divisible by 225)

$a = 1125$ (The number nearer to 1000 which is divisible by 225)

$d = 225$

ATQ,

$7875 = 1125 + (n - 1)225$

$\Rightarrow (7875 - 1125) = (n - 1)225$

$$\Rightarrow (n - 1) = \frac{6750}{225}$$

$\Rightarrow (n - 1) = 30$

$\Rightarrow n = 30 + 1 = 31$

$\therefore$ Required answer = **31**

7. A Let x be the maximum marks

then, pass marks = 24% of x + 12 = 30% of x + 6 $\Rightarrow$ 6% of x = 6 $\Rightarrow x$ = 100

Maximum marks x = **100**

$$\text{Pass marks} = \frac{30}{100} \times 100 + 6 = \mathbf{36.}$$

8. D Here, 12 – 2 = 10,16 – 6 = 10,24 – 14 = 10

Now, LCM of 12, 16 and 24 = 48

$\therefore$ The lowest 4-digit number exactly divisible by 48 = 1008

$\therefore$ Required number = 1008 – 10 + 48 = **1046**

9. B $$\frac{\sqrt{24} + \sqrt{600}}{\sqrt{216}} = \frac{2\sqrt{6} + 10\sqrt{6}}{6\sqrt{6}}$$

$$= \frac{12\sqrt{6}}{6\sqrt{6}} = \mathbf{2}$$

10. C Let the required number of extra days =D – 4.

ATQ,

$300 \times 31 = 27 \times 300 + 120 \times D$
$4 \times 300 = 120 \times D$
$\Rightarrow D = 10$ days
$\therefore$ Extra number of days $= (10 - 4) =$ **6 days**

11. CDownstream speed (u) $= \frac{D}{T} = \frac{8}{40} \times 60$
$= 12$ km/h

Upstream speed (v) $= \frac{D}{T} = \frac{3}{30} \times 60$
$= 6$ km/h

Speed of boat in still water $= \frac{1}{2}(u + v)$

$= \frac{1}{2}(12 + 6) =$ **9 km/h**

Speed of stream $= \frac{1}{2}(u - v) = \frac{1}{2}(12 - 6)$
$=$ **3 km/h**

12. C Let the original number of students in two classes be $2x$ and $3x$ respectively.
ATQ,

$$\frac{2x+20}{3x+20} = \frac{4}{5}$$

$\Rightarrow 10x + 100 = 12x + 80$
$\Rightarrow 12x - 10x = 100 - 80$
$\Rightarrow 2x = 20$

$$\Rightarrow x = \frac{20}{2} = 10$$

$\therefore$ Total number of students originally
$= 2x + 3x = 5x$ (put $x = 10$)
$= 5 \times 10 =$ **50**

13. D $4\sin^2\theta + 5\cos^2\theta$
$= 4\sin^2\theta + 4\cos^2\theta + 5\cos^2\theta$
$= 4(\sin^2\theta + \cos^2\theta) + 5\cos^2\theta$
$= 4 + \cos^2\theta$ $[\because \sin^2\theta + \cos^2\theta = 1]$
$\because$ Minimum value of $\cos\theta = -1$
But $\cos^2\theta \geq 0$, when $\theta = 90°$
$[\because \cos 0° = 1, \cos 90° = 0]$
$\therefore$ Required minimum value $= 4 + 0 =$ **4**

14. B $x = 3 + 2\sqrt{2}$

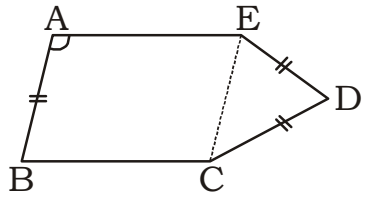
$$\therefore \frac{1}{x} = 3 \times 2\sqrt{2}$$

$$\therefore \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = x + \frac{1}{x} - 2$$

$$\Rightarrow \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 = 3 + 2\sqrt{2} + 3 - 2\sqrt{2} - 2 = 4$$

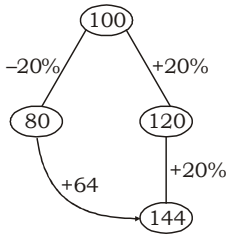
$$\Rightarrow \sqrt{x} - \frac{1}{\sqrt{x}} = 2 \Rightarrow 3\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) = 3 \times 2 =$$ **6**

15. C



$\angle BCE = 94°$, AB = CD = ED (given)
$\therefore$ CD = ED = CE $[\because$ AB = CE$]$
ΔECD is an equilateral triangle.
$\therefore \angle ECD = 60°$
$\angle BCD = 94° + 60°$
$=$ **154°**

16. D Let the cost price of an article = ₹ 100
ATQ,



Original Profit = 20%

New Profit $= \frac{64}{80} \times 100 = 80\%$
$\therefore$ Change in profit percent
$= \frac{(80 - 20)}{20} \times 100$
$=$ **300%**

17. C $\tan^2\alpha = 1 + 2\tan^2\beta$
$\Rightarrow \sec^2\alpha - 1 = 1 + 2(\sec^2\beta - 1)$
$\Rightarrow \sec^2\alpha - 1 = 2\sec^2\beta - 1$

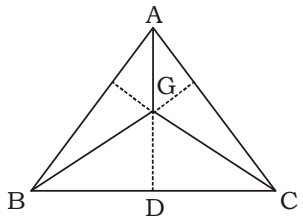
$$\Rightarrow \frac{1}{\cos^2\alpha} = \frac{1}{2\cos^2\beta}$$

$\Rightarrow \sqrt{2}\cos\alpha = \cos\beta$

$\therefore \sqrt{2}\cos\alpha - \cos\beta =$ **0**

18. B $x = 7$
$\therefore x^5 - 8x^4 + 8x^3 - 8x^2 + 8x - 2$
$= x^5 - (7 + 1)x^4 + (7 + 1)x^3 - (7 + 1)x^2 + (7 + 1)x - 2$
$= x^5 - 7x^4 - x^4 + 7x^3 + x^3 - 7x^2 - x^2 + 7x + x - 2$
When $x = 7$,
$= 7^5 - 7^5 - 7^4 + 7^4 + 7^3 - 7^3 - 7^2 + 7^2 + 7 - 2 =$ **5**

19. C



Area of ΔABC = 6 × ar(ΔBGD)
= 6 × 9 = **54 cm²**

20. D By componendo and dividendo,

$$\frac{(x^3+3x)+(3x^2+1)}{(x^3+3x)-(3x^2+1)} = \frac{234+109}{234-109}$$

$$\Rightarrow \frac{(x+1)^3}{(x-1)^3} = \frac{343}{125}$$

$$\Rightarrow \left(\frac{x+1}{x-1}\right)^3 = \left(\frac{7}{5}\right)^3$$

$$\Rightarrow \frac{x+1}{x-1} = \left(\frac{7}{5}\right) \Rightarrow 5x + 5 = 7x - 7 \Rightarrow x = \mathbf{6}$$

21. B Let the original volume of cylinder be 100
⇒ Volume after change

$$= 100 \times \frac{150}{100} \times \frac{150}{100} \times \frac{40}{100} = 90$$

Hence, percent decrease = 100 – 90 = **10%**

22. C $1 \times 3 \times 5 \times 7 \times \ldots\ldots\ldots \times 99 \times 2^8$.
For calculating number of zeros we have to find the combination of 2 and 5. Here no. of 2's is 8. So the max possible number of zeros is **8.**

23. D Percentage of students failed in 2016

$$= \frac{35}{200} \times 100 = \mathbf{17.5\%}$$

24. A Total passed students,
= 140 + 150 + 165 = 455
Total students
= 170 + 195 + 200 = 565
∴ Required percentage

$$= \frac{455}{565} \times 100 = \frac{9100}{113} = \mathbf{80\frac{60}{113}\%}$$

25. B Required percentage

$$= \frac{20}{170} \times 100 = \frac{200}{17} = \mathbf{11\frac{13}{17}\%}$$

26. B Change 'stem' into 'stems', as the subject of the sentence 'need' is singular.

27. A Change 'adopt' into 'adapt', which means 'to make oneself suitable to a new environment'. 'Adopt' means 'to accept'.

28. A Change 'is' into 'are', as 'people' takes plural verb.

29. A Change 'you' into 'your'. 'Gerund' is preceded by a possessive adjective.

39. C 'Information' takes no plural form.

51. D $\varepsilon_1 = \frac{1}{E}(\sigma_1 - 2\mu\sigma_2)$

$$= \frac{1}{2\times10^5} \times (440 + .3 \times 2000) = 2.5 \times 10^{-3}$$

elongation of bar in longitudinal direction

$\Delta L = \varepsilon_1 \times L$
= 25 × 10^{-3} × 400
= 1mm

52.B $\Delta L = \frac{WL}{AE}$

$$= \frac{5000 \times \pi \times 10}{\frac{\pi}{4}(2)^2 \times 2 \times 10^6}$$

= .25cm

53.B

Mx = – 10x
$M_{at\ 2m}$ = – 20KNm.

$$\sigma = \frac{M}{I}y = \frac{M}{Z}$$

$$= \frac{20}{\frac{(.3)(.4)^2}{6}} = 2500\,KN/m^2.$$

54.A In case of pure shear
$\sigma_{max} = \tau_{xy}$ = 80 N/mm²
$\sigma_{min} = -\tau_{xy}$ = – 80 N/mm²

55.C E = 2G (1 – μ)

$$\frac{E}{G} = 2\ (1 + .25) = 2.5$$

57.C $R_A = R_B = 4$
$\Sigma M_A = 0$
$R_B \times 8 - 4 \times 6 - 8 = 0$
R_B = 4KN
R_A = 0

66.B $C_r = 1.25\ \frac{L_{eff}}{48 \times B}$

$$= 1.25 - \frac{4.8}{\frac{48(250)}{1000}} = .85$$

76.B $\gamma_d = \frac{\gamma_{sat}}{1+w}$

$$1 + w = \frac{2000}{1500}$$

$$w = \frac{20-15}{15} = \frac{1}{3} = 33.33\%$$

78.C $\frac{\Delta H}{H_0} = \frac{\Delta e}{1+e_0}$

$$\Delta H = \left(\frac{\Delta e}{1+e_0}\right) H_0 \Rightarrow \frac{1-.92}{1+1} \times 2000 = 80mm$$

79.C Net ultimate bearing capacity

$[q_{u\,net} = CN_C]$

$$N_C = 5\left(1 + .2\left(\frac{B}{L}\right)\right)\left(1 + .2\left(\frac{D_f}{B}\right)\right) \text{ for } \frac{D_f}{B} < 2.5$$

$$= 5\left(1 + .2 \times \frac{1}{2}\right)\left(1 + .2\frac{2}{1}\right) = 7.7$$

$$C = \frac{q_u}{2}$$

$$= \frac{100}{2} = 50KN^2$$

$\because q_{unet} = 50 \times 7.7 = 385\ KN/m^2$

88.C $Q = \frac{1}{n} AR^{2/3} S_o^{1/2}$

A=By, R=y

$$Q = \frac{1}{n} \times By \times y^{2/3} \times S_0^{1/2}$$

$$\frac{Q}{B} = \frac{1}{n} \times y^{5/3} S_0^{1/2}$$

$$y^{5/3} = \frac{.5 \times .01}{(.0004)^{1/2}}$$

$$y = .43m$$

89.C $E.L = \frac{(y_2 - y_1)^3}{4y_1 y_2} = \frac{(1.2-.3)^3}{4 \times .3 \times 1.2} = .5062m$

90.D Discharge per unit width

$$q = \frac{5}{2} = 2.5\, m^3 / s.$$

$$y_c = \left(\frac{q^2}{g}\right)^{1/3} = \left(\frac{2.5^2}{9.81}\right)^{1/3} = .86m$$

96.A $V_1 = \frac{R^{2/3} S^{1/2}}{N}$

$$V_1 = \frac{R^{2/3}(0.0009)^{1/2}}{N}$$

$$V_2 = \frac{R^{2/3}(0.0001)^{1/2}}{N}$$

$$\text{Area} = \frac{Q}{V}$$

$\because A_1 = A_2$

$$\frac{Q_1}{V_1} = \frac{Q_2}{V_2}$$

$$\frac{30}{\frac{R^{2/3}(.0009)^{1/2}}{N}} = \frac{Q_2}{\frac{R^{2/3}(.0001)^{1/2}}{N}}$$

$$Q_2 = 10m^3 / \sec.$$

106.D $e = \frac{V^2}{225R} = \frac{(125)^2}{225 \times 45} = .154$

107.C For 1 lane 2 way

S.S.D = 2(S.S.D)

$$S.S.D = 2 \times \left(.278Vt + \frac{V^2}{254 \times f}\right)$$

$t = 2.5$

$f = .35$

$$S.S.D = 2 \times \left(.278 \times 50 \times 2.5 + \frac{50^2}{254 \times .35}\right)$$

$\simeq 125.74$

C is nearest option.