BPSC TEST

Date: 19 March, 2019

TEST 15 (OBJECTIVE SOLUTION)...

ANSWERS

1.	(b)	11.	(a)	21.	(c)	31.	(a)	41.	(a)
2.	(b)	12.	(c)	22.	(b)	32.	(c)	42.	(a)
3.	(b)	13.	(d)	23.	(a)	33.	(b)	43.	(d)
4.	(d)	14.	(a)	24.	(a)	34.	(a)	44.	(a)
5.	(b)	15.	(d)	25.	(a)	35.	(a)	45.	(b)
6.	(b)	16.	(c)	26.	(a)	36.	(b)	46.	(a)
7.	(d)	17.	(a)	27.	(d)	37.	(b)	47.	(a)
8.	(c)	18.	(a)	28.	(c)	38.	(b)	48.	(d)
9.	(b)	19.	(d)	29.	(a)	39.	(c)	49.	(c)
10.	(a)	20.	(a)	30.	(a)	40.	(c)	50.	(d)

BPSC TEST-15 Solutions

Date: 19 March, 2019

1. **(b)**

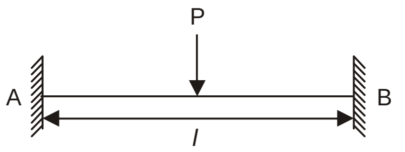
For D_s, make the given beam as fixed D_s = support reaction removed - constraint added.

$\Rightarrow$ Constraint added = 1 and support reaction removed = 2

$D_s = 2 - 1 = 1$

2. **(b)**

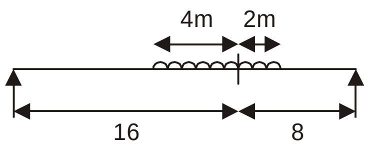
3. **(b)**

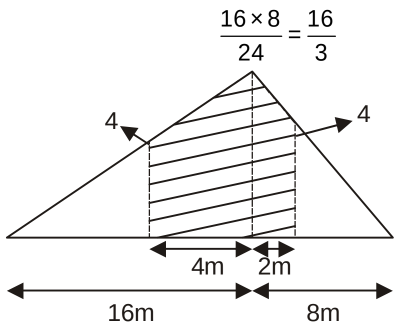


$$M_{FAB} = M_{FBA} = \frac{Pl}{8}$$

4. **(d)**

When UDL length < span, UDL must be spaced such that the section divides the span as well as length of UDL in the same ratio.





ILD for B.M

$\therefore$ Max B.M at section 8 m from right end

$$= \left[\left(\frac{4+\frac{16}{3}}{2}\right)\times 4 + \left(\frac{\frac{16}{3}+4}{2}\times 2\right)\right]\times 4$$

$$= \left[\frac{28}{3\times 2}\times 6\right]\times 4$$

$= 28 \times 4 = 112$ kN-m

5. **(b)**

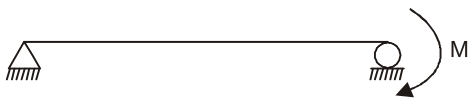
6. **(b)**

$$k = \frac{2EI}{l}\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

$$f = \frac{1}{k} = \left(\frac{l}{2EI}\right)\left(\frac{1}{4-1}\right)\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$$

$$= \frac{l}{6EI}\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$$

7. **(d)**

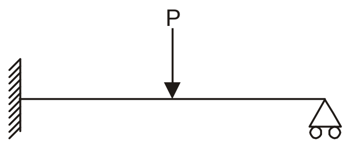


Because rotation is not restrained at hinged end, no moment will be carried over.

Hence, carry over factor = 0

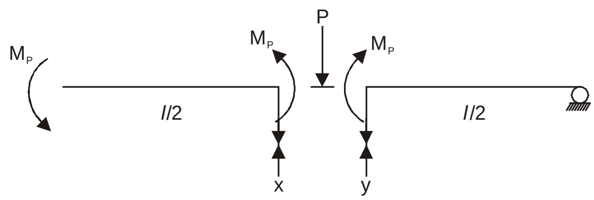
8. **(c)**

9. **(b)**



Number of plastic hinge required for collapse = $D_s + 1 = 1 + 1 = 2$

One will form at fixed end and other at location of point load



$$x \times \frac{l}{2} = 2M_p \Rightarrow x = \frac{4M_p}{L}$$

$$y \times \frac{l}{2} = M_p \Rightarrow y = \frac{2M_p}{L}$$

$P = x + y$

$$= \frac{6M_p}{l}$$

10. **(a)**

< 10 mm plate $\rightarrow$ 3 mm

10 – 20 mm plate $\rightarrow$ 5 mm

20 – 32 mm plate $\rightarrow$ 6 mm

32 – 50 mm plate $\rightarrow$ 8 mm

11. **(a)**

12. **(c)**

13. **(d)**

14. **(a)**

15. **(d)**

M 20 is grade 4.6 bolt

$\therefore$ Ultimate strength = 400 N/mm^2 and yield strength

= 0.6 × 400

= 240 N/mm^2

16. **(c)**

17. **(a)**

18. **(a)**

19. **(d)**

20. **(a)**

21. **(c)**

22. **(b)**

For OPC of grade 33, crushing strength

At 3 days = 16 MPa

7 days = 22 MPa

28 days = 33 MPa

23. **(a)**

For = $0.7\sqrt{f_{ck}}$

= $0.7 \times \sqrt{25}$

= 3.5 N/mm^2

24. **(a)**

E = $5000\sqrt{f_{ck}}$

= $5000 \times \sqrt{25}$

= 25000 MPa

25. **(a)**

Split cylinder is used to determine tensile strength of concrete and not cement.

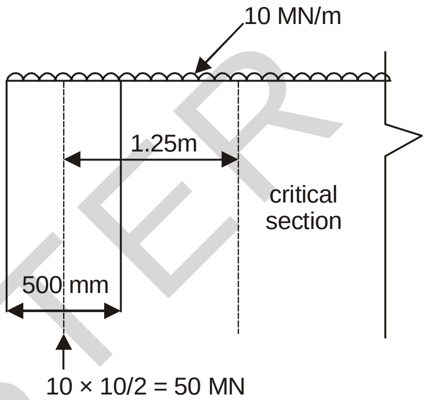
26. **(a)**

Strain profile is linear.

27. **(d)**

According to IS : 456 – 2000 minimum grade of concrete to be used along sea coast is M 30

28. **(c)**



$\therefore$ Critical section is 'd' from face of the support

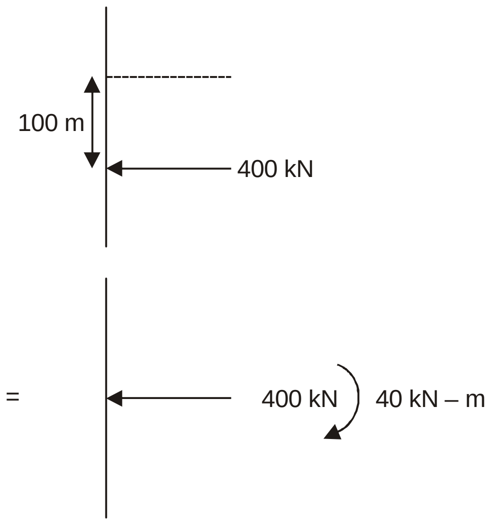
$\therefore$ Design shear force = $\frac{10 \times 10}{2} - 1.25 \times 10$

= 37.5 MN

29. **(a)**

30. **(a)**

31. **(a)**



$$\therefore \sigma_{max} = \frac{400 \times 1000}{200 \times 400} + \frac{400 \times 10^3 \times 100 \times 200}{\frac{200 \times 400^3}{12}}$$

= 5 + 7.5

= 12.5 MPa

32. **(c)**

33. **(b)**

34. **(a)**

35. **(a)**

$$K_a = \frac{1 - \sin\phi}{1 + \sin\phi}$$

$$= \frac{1 - \frac{1}{2}}{1 + \frac{1}{2}}$$

$$= \frac{1 - \frac{1}{2}}{1 + \frac{1}{2}} = \frac{\frac{1}{2}}{\frac{3}{2}} = \frac{1}{3}$$

36. **(b)**

37. **(b)**

38. **(b)**

$$\sigma_a = K_a \gamma z - 2c\sqrt{K_a}$$

For $\sigma_a = 0$

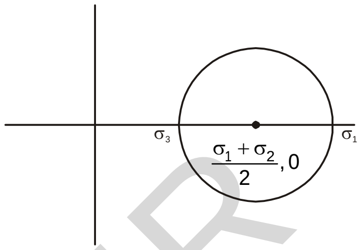
$$2c\sqrt{K_a} = K_a \gamma z$$

$$Z = \frac{2c}{\gamma\sqrt{K_a}} = \frac{2c}{\gamma\sqrt{\frac{1}{\tan^2\left(45 + \frac{\phi}{2}\right)}}}$$

$$= \frac{2c}{\gamma} \times \tan\left(45 + \frac{\phi}{2}\right)$$

$$= \frac{2C}{\gamma}\tan\alpha$$

39. **(c)**



40. **(c)**

Shear strength, $\tau = C + \sigma\tan\phi$

Where, C = cohesion

σ = vertical stress (effective)

ϕ = internal friction angle

41. **(a)**

42. **(a)**

43. **(d)**

44. **(a)**

45. **(b)**

$$\frac{\gamma_{sat}}{\gamma_{dry}} = 1.25$$

G_s = 2.65

$$\frac{\frac{G+e}{1+e}\gamma_w}{\frac{G\gamma_w}{1+e}} = 1.25$$

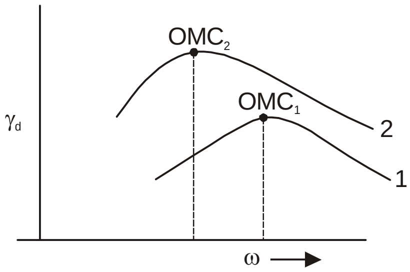
or, $\frac{G+e}{G} = 1.25 \quad (S = 1)$

or, $\therefore$ e = 0.663

46. **(a)**

Toughness index = $\frac{\text{Plsticity index}}{\text{Flow index}}$

47. **(a)**



Curve 1 : lower compactive effort

Curve 2 : large compactive effort

48. (d)

Seepage pressure (P) = $h_L \gamma_w$

Seepage force = P × A

$= h_L \gamma_w A$

$$\frac{\text{Seepage force}}{\text{volume}} = \frac{h_L \gamma_w A}{A \times L}$$

$$= \frac{h_L}{L}\gamma_w$$

$= i\gamma_w$

49. (c)

C = 10 kN/m^2

q_u = 2 × C

= 20 kN/m^2

50. (d)