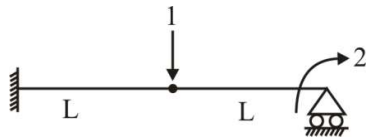


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Civil Engineering

1. Muller-Breslau Principle is applicable for

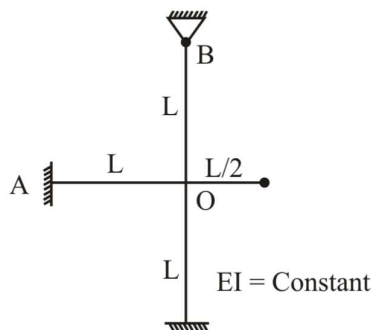
- (a) Determinate structures
- (b) Indeterminate structures
- (c) Both Determinate & Indeterminate
- (d) None of these

2. The flexibility coefficient f_{11} for the given beam is:



- (a) $\frac{L^3}{3EI}$
- (b) $\frac{L^3}{12EI}$
- (c) $\frac{L^3}{24EI}$
- (d) $\frac{L^3}{48EI}$

3. The stiffness coefficient of member OA is (O is a rigid joint)



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- (a) $\frac{3}{11}$
 (b) $\frac{7}{11}$
 (c) $\frac{4}{11}$
 (d) Zero

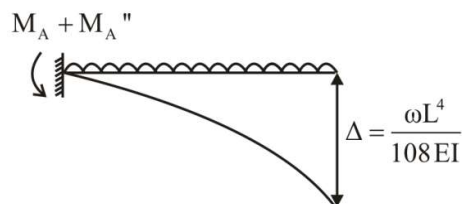
4. Due to some symmetric system of loading on a fixed beam, the area of the free BMD is

120kN-m. The sum of the fixed end moments is (in kN-m)

- (a) 60
 (b) 120
 (c) 180
 (d) 240

5. A fixed beam AB of span L carries a UDL ω per unit length. During loading, support B sinks downwards by an amount of δ . If $\delta = \frac{\omega L^4}{108 EI}$, what is the fixing

moment At A?



- (a) $\frac{7\omega L^2}{36}$
 (b) $\frac{5\omega L^2}{36}$
 (c) $\frac{3\omega L^2}{36}$

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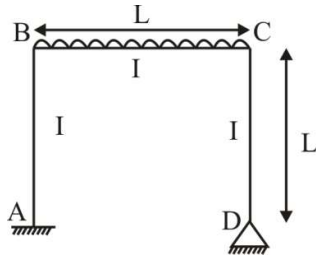
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(d) $\frac{\omega L^2}{36}$

6. Consider the below rigid jointed frame structure



- (a) There will be no sway
 (b) Sway towards right
 (c) Sway towards left
 (d) Cannot be determined

7. Sag rods used for wind bracing in structures are usually pretensioned by

1. Detailing them slightly shorter in length than required
2. Tightening the rod with sleeve nut
3. Tightening the rod with turn-buckle

- (a) 1 or 2
 (b) 1 or 3
 (c) 2 or 3
 (d) 1, 2, 3

8. Limits are placed on slenderness ratio of tension members.

- (a) To check the crippling of the member
 (b) To limit the buckling of the member
 (c) To check the lateral vibration of the member
 (d) To check crookedness of the member

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9. The slenderness ratio of compression members in trusses subjected to wind loads and possible reversal of stresses is limited to:
- (a) 180
 - (b) 250
 - (c) 300
 - (d) 350
10. Minimum number of battens required in a built-up column are:
- (a) 2
 - (b) 3
 - (c) 4
 - (d) 6
11. Two ISMC channels placed back to back at a spacing of 250mm carry axial load of 1600kN. The lacing system showed designed to resist a transverse shear equal to :
- (a) 33 kN
 - (b) 40 kN
 - (c) 80 kN
 - (d) 100 kN
12. Web crippling in steel beam occurs due to
- (a) Column action of compression flange
 - (b) Failure of web under concentrated load
 - (c) Excessive bending moment
 - (d) Secondary bending moment

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13. For block shear failure of a tension member, failure occurs along a path through the connection involving.
- (a) Tension on the two perpendicular planes
 - (b) Shear on the two perpendicular planes
 - (c) Tension on one plane and shear on other perpendicular plane
 - (d) Tension on one plane and compression on the other perpendicular plane
14. The area under the β -distribution curve is divided into two equal halves by a vertical ordinate through:
- (a) Expected time
 - (b) Optimistic time
 - (c) Most likely time
 - (d) Pessimistic time
15. The time beyond which the direct cost will not be reduced with the increase in time is:
- (a) Normal time
 - (b) Crash time
 - (c) Optimistic time
 - (d) Optimum time
16. **List I (Management Endeavour)** **List-II (Relates to)**
- | | |
|--------------------|--|
| A. Work study | 1. One-off projects essentially |
| B. ABC analysis | 2. Dependent on billing cycles and payment terms |
| C. PERT | 3. Optimizing cost locked up in inventory |
| D. Working capital | 4. Rest allowances |
- A B C D

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- (a) 2 1 3 4
- (b) 4 1 3 2
- (c) 2 3 1 4
- (d) 4 3 1 2

17. Break-even analysis can be used in:

- (a) Choosing the best product
- (b) Selection among alternatives
- (c) Choosing the critical method
- (d) Selecting the best equipment

18. Downtime cost is

- (a) Cost for not working due to repairs etc
- (b) Cost during production
- (c) Cost while commissioning the equipment
- (d) None of these

19. Among the earth excavating equipment, which one has very good loading efficiency?

- (a) Clam shell
- (b) Dragline
- (c) Back hoe
- (d) Power shovel

20. Excess silica in clay

- (a) Makes the brick brittle and weak
- (b) Makes the brick crack and warp on drying
- (c) Changes colour of the brick from red to yellow
- (d) Improves impermeability and durability of the brick

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21. Which of the following statement is incorrect?
- (a) Uniform workability ensures uniform strength
 - (b) The ball penetration test can be performed on concrete placed in the forms
 - (c) Slump test is more accurate than compacting factor test and the results can be reproduced
 - (d) Vee-Bee test is suitable for low and very low workability
22. Permeability of concrete reduces
- (a) with the carbonation of concrete
 - (b) with the strength of cement paste
 - (c) with the decreases in the porosity
 - (d) All of these
23. As compared to the static tests, the dynamic tests on concrete give
- (a) Higher value of Poisson's ratio
 - (b) Lower value of Poisson's ratio
 - (c) The same value of Poisson's ratio
 - (d) All of the above depending on test condition
24. Consider the following codes:
1. Rapid analysis machine
 2. EDTA titration method
 3. HCL heat of solution meshed
 4. Accelerated strength method
- The cement content in a sample of fresh concrete can be determined by
- (a) 1 only
 - (b) 1, 2 and 3 only
 - (c) 3 and 4 only

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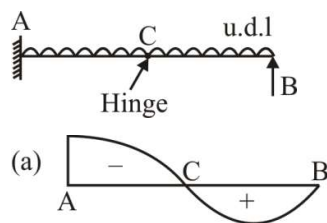
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- (d) All of above
25. For a given shear force across a symmetrical 'I' section the intensity of shear stress is maximum at the,
- (a) Extreme fibre
 - (b) Centroid of section
 - (c) At the junction of flange and web, but on the web
 - (d) At the junction of flange and web, but on the flange
26. The shear stress at any section of a shaft subjected to torsion is maximum
- (a) At the centre of section
 - (b) At a distance of $r/2$ from the centre
 - (c) At the top of the surface
 - (d) At the distance $3/4r$ from the surface
27. The slenderness ratio of a vertical column of square cross-section of 7cm side and 300 cm length, is
- (a) 73.5
 - (b) 148.5
 - (c) 146.5
 - (d) 144.5
28. A propped cantilever beam shown in figure is having internal hinge at its mid span. Which one of the following is the shape of bending moment?



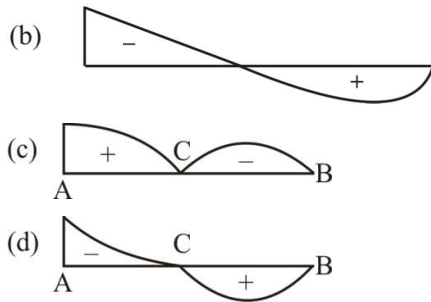
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29. Two steel shaft 'A' and 'B' are used for transmitting power. The rate of revolution shaft, i.e., $N_A/N_B = 3$. The ratio of torque on shafts, i.e., $T_A/T_B = 2/3$. The ratio of power transmitted by the shafts, i.e., P_A/P_B should be

- (a) 1/2
- (b) 1/3
- (c) 2
- (d) 9/2

30. Diagonal tension, failure in a reinforced concrete beam,

1. Occurs under large shear force and less bending moment
2. Occurs under large bending moment and less shear force
3. Results in cracks at 90° with the horizontal
4. Results in cracks at 45° with the horizontal

Of these statements

- (a) 1 and 3 are correct
- (b) 1 and 4 are correct
- (c) 2 and 3 are correct
- (d) 2 and 4 are correct

31. The torsional longitudinal reinforcement in RCC beam should be placed at,

- (a) Each corner of beam
- (b) Middle of each face

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- (c) Middle of the beam
(d) Core of the beam
32. In a reinforced concrete slab of 150mm thickness, the maximum size of reinforcing bar is,
(a) 12mm
(b) 16mm
(c) 20mm
(d) 22mm
33. If modular ratio is 'm' effective depth is 'D' and stress ration ' r ' $\left(= \frac{\sigma_{st}}{\sigma_{cbc}} \right)$ the depth of neutral axis of a balanced section is
(a) $\frac{m}{m-r} \times D$
(b) $\frac{m}{m+r} \times D$
(c) $\frac{m+r}{m} \times D$
(d) $\frac{m}{m} \times D$
34. Match the following:
- | Column I | Column II |
|--|---|
| A. Lap length for bars in flexural tension greater | 1. L_d or 30ϕ whichever is greater |
| B. Lap length for bars in direct tension 200mm | 2. Not less than 15ϕ and 200mm |

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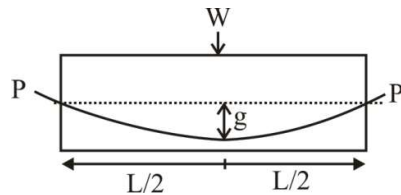
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- C. Straight length of lap shall be
 D. Lap splices shall
 36mm ϕ
3. $2L_d$ or 30ϕ whichever is greater
 4. Not be for bars larger than

	A	B	C	D
(a)	3	1	2	4
(b)	1	3	2	4
(c)	1	3	4	2
(d)	3	1	4	2

35. If 'P' is pre-stressing force applied at a maximum eccentricity 'g' at mid span as shown, then to balance concentrated load 'w', balancing load will be



- (a) $2.5 Pg/L$
 (b) $2 Pg/L$
 (c) $3 Pg/L$
 (d) $4 Pg/L$
36. In pre-stressed concrete, high-grade concrete is used for,
 (a) Controlling the pre-stress loss
 (b) Having concrete of low ductility
 (c) Having concrete of high brittleness
 (d) Having low creep
37. An axially loaded column is of 300×300 mm size. Effective length of column is 3m. What is the minimum eccentricity of the axial load for the column?
 (a) 0

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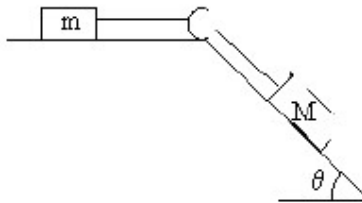
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- (b) 16mm
- (c) 10mm
- (d) 20mm

81. Find the maximum value of $\frac{M}{m}$ in the situation shown in figure below so that the system remains at rest. Coefficient of friction at all surface of contact is μ . Pulley provided is smooth and $\tan \theta > \mu$.



- (a) $\frac{M}{m} = \frac{\mu}{\sin \theta - \mu \cos \theta}$
- (b) $\frac{M}{m} = \frac{\mu}{\cos \theta - \mu \sin \theta}$
- (c) $\frac{M}{m} = \frac{\mu}{\sin \theta + \mu \cos \theta}$
- (d) $\frac{M}{m} = \frac{\mu}{\cos \theta - \mu \sin \theta}$

82. A very broad elevator is going up vertically with a constant acceleration of $2 \frac{m}{s^2}$. At the instant when its velocity is 4 m/s a ball is projected from the floor of the lift with a speed of 4 m/s relative to the floor at an elevation of 30° . The time taken by the ball to return the floor is

- (a) $\frac{1}{2}$ s
- (b) $\frac{1}{3}$ s
- (c) $\frac{1}{4}$ s

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(d) 1s

83. A small block of mass 100 g moves with uniform speed in a horizontal circular groove, with vertical side walls, of radius 25 cm. If the block takes 2 seconds to complete one round, the normal contact force by the side wall of the groove is _____ (N).

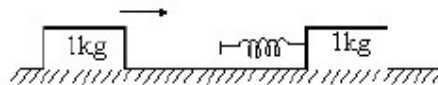
(a) 0.25

(b) 0.50

(c) 1.25

(d) 2.22

84. Each block shown in figure below has mass 1 kg. The rear block moves with a speed of 2 m/s towards the front block kept at rest. The spring attached to the front block is light and has a spring constant of 50 N/m. The maximum compression of the spring _____ in meters is



(a) 0.20

(b) 0.02

(c) 0.028

(d) 0.03

85. A wheel rotating at an angular speed of 20 rad/sec is brought to rest by a constant torque in 4 seconds. If the moment of inertia of the wheel about the axis of rotation is 0.2 kg-m², the work done by the torque in the first two seconds is _____ (J).

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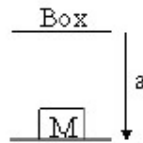
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- (a) 15
 (b) 30
 (c) 130
 (d) 60

86. With what acceleration should the box shown in figure below descend so that the block of mass M exerts a force $\frac{Mg}{4}$ on the floor of the box ?



- (a) $\frac{2g}{4}$
 (b) $\frac{3g}{4}$
 (c) $\frac{5g}{4}$
 (d) g

87. The settlement of prototype in clayey material may be estimated using plate load test data from the following expression.

- (a) $S_{\text{prototype}} = S_{\text{plate}} \times \left(\frac{B_{\text{Prototype}}}{B_{\text{Plate}}} \right)$
 (b) $S_{\text{prototype}} = S_{\text{plate}} \times \left(\frac{B_{\text{Plate}}}{B_{\text{Prototype}}} \right)$
 (c) $S_{\text{prototype}} = S_{\text{plate}} \times \left(\frac{2B_{\text{Prototype}}}{B_{\text{prototype}} + B_{\text{Plate}}} \right)^2$
 (d) $S_{\text{prototype}} = S_{\text{plate}} \times \left(\frac{B_{\text{prototype}} + B_{\text{Plate}}}{2B_{\text{Prototype}}} \right)^2$

88. The slope of the flow curve (I_f) is given by

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(a) $\frac{\omega_2 - \omega_1}{\log_{10} \frac{N_1}{N_2}}$

(b) $\frac{\omega_2 - \omega_1}{\log_{10} \frac{N_2}{N_1}}$

(c) $\frac{\omega_1 - \omega_2}{\log_e \frac{N_1}{N_2}}$

(d) None of the above

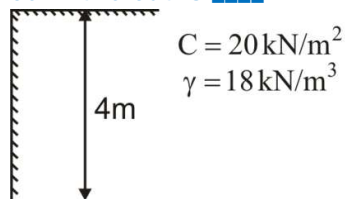
89. Direct measurement of permeability of a soil specimen at any stage of loading in consolidation test can be made

- (a) Only in a fixed ring type of consolidometer
 (b) Only in a floating ring type of consolidometer
 (c) Both (a) and (b)
 (d) None of above

90. In a flownet diagram, the length of the flow line in the last square is 2m, the total head loss is 18m and the number of potential drop is 12. The value of exit gradient is

- (a) 0.33
 (b) 0.75
 (c) 1.33
 (d) 3.00

98. For the cut shown in figure, if the maximum depth of unsupported excavation is 5.5 m, the tensile force in the cut is ____ kN.



- (a) 40.44 kN (b) 42.44 kN (c) 44.44 kN (d) 22.22 kN

99. A 300 m diameter friction pile is embedded 9 m into a homogenous clayey deposit with unconfined compressive strength of 80 kN/m^2 and shear

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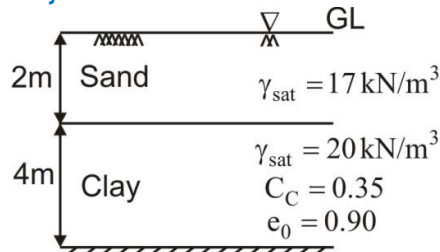
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mobilization factor of 0.5. Using a factor of safety of 3, the allowable load on the pipe is _____ kN.

- (a) 113 kN (b) 114.93 kN (c) 56.5 kN (d) 169.5 kN

100. A soil profile consisting of 2m sand layer underlain by a normally consolidated clay is shown below



A 3m thick layer of fill of unit weight 15 kN/m^3 is placed over the ground surface to cause consolidation of the clay layer. Take $\gamma_w = 10 \text{ kN/m}^3$. The ultimate consolidation settlement of the clay layer in cm (correct to nearest integer) due to placing of the fill is _____ cm.

- (a) 12 (b) 18 (c) 27 (d) 54

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Discussion of the Questions Paper : Classroom No.4 , Friday 4-6pm

ANSWER-KEY									
SCHOLARSHIP TEST			CIVIL-CE				TestCode : 002CE		
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c	a	c	b	b	b	d	c	d	c
11	12	13	14	15	16	17	18	19	20

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b	b	c	a	a	d	b	a	d	b
21	22	23	24	25	26	27	28	29	30
c	d	a	d	b	c	b	d	c	b
31	32	33	34	35	36	37	38	39	40
b	b	b	b	d	d	d	a	b	a
41	42	43	44	45	46	47	48	49	50
a	b	b	a	a	a	b	c	b	c

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