

**UPPSC-AE (Assistant Engineer) Sample Test Paper**  
**Civil Engineering**

1. For a structure to have internal stability, consider the following statements. Which of these are true?

1. There should be no relative movement between members
2. Number of external reactions should be equal to 3 for a 2-D structure and 6 for a 3-D structure.
3. The reactions should be coplanar and concurrent.
4. There should not be formation of 3 consecutive hinges.

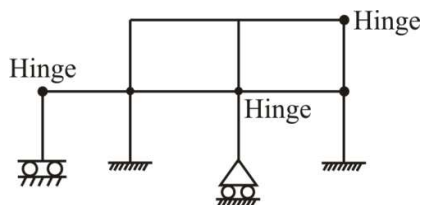
- (a) 1 and 2
- (b) 1, 2 and 3
- (c) 1 and 4
- (d) 2 and 3

2. The kinematic indeterminacy for the given figure is? (consider members to be axially rigid)



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

3. Total degree of static indeterminacy (external and internal) of the plane frame shown below is:



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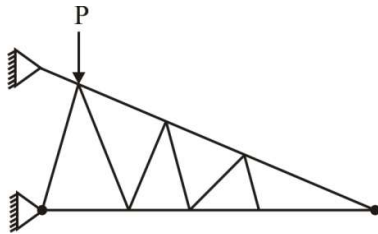
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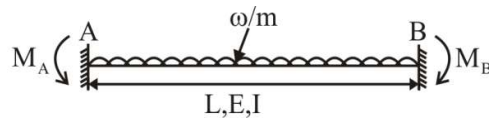
- (a) 5
- (b) 7
- (c) 8
- (d) 10

4. The number of zero force members in the truss given below is:



- (a) 14
- (b) 16
- (c) 17
- (d) 18

5. The fixed end moment  $M_A$ ,  $M_B$  for the given beam is



- (a)  $\frac{\omega L^2}{20}, \frac{\omega L^2}{30}$
- (b)  $\frac{\omega L^2}{16}, \frac{\omega L^2}{16}$
- (c)  $\frac{\omega L^2}{12}, \frac{\omega L^2}{12}$
- (d)  $\frac{\omega L^2}{8}, \frac{\omega L^2}{8}$

6. An arch resist the external load by:

- (a) Normal thrust only
- (b) Normal thrust and bending moment

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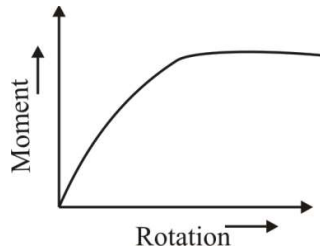
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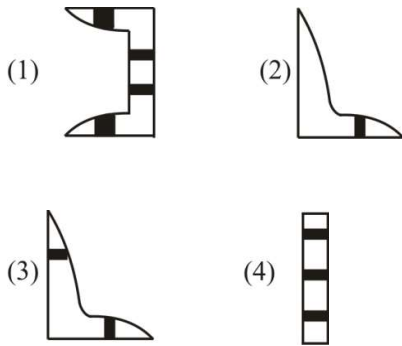
- (c) Bending moment and radial shear  
(d) Normal thrust, radial shear and bending moment
7. The deflection  $\delta$ , strain energy  $U$  and load  $P$  on a truss are related by:
- (a)  $\delta = \frac{\partial^2 U}{\partial P^2}$   
(b)  $\delta = \frac{\partial U}{\partial P}$   
(c)  $\delta = \frac{\partial^3 U}{\partial P^3}$   
(d)  $\delta = \left(\frac{\partial U}{\partial P}\right)^2$
8. If the diameter of a bolt is 20mm, then the maximum number of bolts that can be accommodated in one row in a 150mm wide flat is (are)
- (a) 1  
(b) 2  
(c) 3  
(d) 4
9. For same number of bolts, the maximum efficiency is yielded by :
- (a) Chain  
(b) Staggered  
(c) Diamond  
(d) Staggered diamond
10. The effective length of fillet weld is:
- (a) Total length  $-2 \times$  throat size  
(b) Total length  $-2 \times$  weld size  
(c)  $0.7 \times$  total length

$$(d) \text{ Total length} - \left( \frac{\text{weld size}}{\sqrt{2}} \right)$$

11. The moment-rotation curve shown below is for a



- (a) Rigid joint  
 (b) Flexible joint  
 (c) Pin-joint  
 (d) Semi-rigid joint
12. The members affected by shear lag is (are)?



- (a) 1 and 3  
 (b) 2 and 3  
 (c) 2 only  
 (d) 4 only
13. In case of wind or earthquake load taken into account, in design of riveted connection, permissible stresses in rivets may be exceeded by
- (a) 25%  
 (b) 33.33%  
 (c) 16.67%

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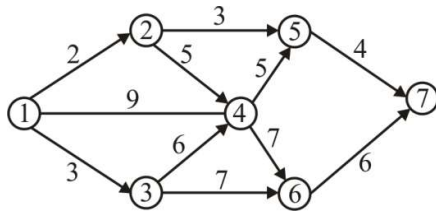
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(d) 40%

14. In the network shown in figure. Latest start time (LST) and latest finish time (LFT) of activity 4-6 are respectively.



- (a) 9, 16  
 (b) 16, 19  
 (c) 11, 18  
 (d) 18, 11
15. For digging below the machine level such as trances and footings, the best type of equipment is:
- (a) Power shovel  
 (b) Back hoe  
 (c) Drag line  
 (d) None of these
16. Consider the following:
1. Class of material
  2. Angle of swing
  3. Depth of cutting
  4. Skill of operator
- The output of power shovels depends on:
- (a) 1, 2 and 3 only  
 (b) 2, 3 and 4 only  
 (c) 1, 2 and 4 only  
 (d) 1, 2, 3 & 4

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17. If the optimistic time, most likely time and pessimistic time for an activity are 8, 9 and 13, the expected time  $t_E$  and variance are respectively.
- (a) 9.5 and (5/6)
  - (b) 9.5 and (25/36)
  - (c) 8.5 and (5/6)
  - (d) 8.5 and (25/36)
18. A graphical and logical model which lists out the sequence of various operations which are required to be performed for the final achievement of project objectives is known as
- (a) Bar chart
  - (b) Giant chart
  - (c) Network
  - (d) None of these
19. The independent float affects:
- (a) Only succeeding activities
  - (b) Only preceding activities
  - (c) Only the particular activity involved
  - (d) Both the succeeding and preceding activities
20. Which of the equipment is the result of a compromise between the best loading and the best hauling machine.
- (a) Clamshell
  - (b) Scraper
  - (c) Drag line
  - (d) Back Hoe
21. The compressive strength of a standard good 1 : 3 Portland cement-sand mortar after 3 days of curing should not be less than

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- (a) 70kg/cm<sup>2</sup>
- (b) 115 kg/cm<sup>2</sup>
- (c) 175 kg/cm<sup>2</sup>
- (d) 210 kg/cm<sup>2</sup>

22. Consider the following statements

1. Both C<sub>3</sub>S and C<sub>2</sub>S give the same product on hydration
2. C<sub>2</sub>S hydrates slowly and provides much of the ultimate strength
3. C<sub>3</sub>S having a faster rate of reaction is accompanied by greater heat evolution
4. C<sub>3</sub>S provides more resistance to chemical attacks

The statement (s) in terms of compound composition of cement is (are) correct?

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

23. Blast furnace slag has approximately

- (a) 45% calcium oxide and about 35% silica
- (b) 50% alumina and 20% calcium oxide
- (c) 25% magnesia and 15% silica
- (d) 25% calcium sulphate and 15% alumina

24. Consider the following codes,

1. C<sub>3</sub>S
2. C<sub>2</sub>S
3. C<sub>3</sub>A
4. C<sub>4</sub>AF

To produce low heat cements, it is necessary to reduce the compound

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

25. Among the more common varieties of timber, namely, sal, mango and deodar

1. Sal is the strongest
2. Mango is the least durable
3. Deodar is the lightest

Of these the correct statements are

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

26. 2D-stress at a point is given by a matrix

$$\begin{bmatrix} \sigma_{xx} & \tau_{xy} \\ \tau_{yx} & \sigma_{yy} \end{bmatrix} = \begin{bmatrix} 200 & 30 \\ 30 & 120 \end{bmatrix} \text{MPa}$$

The maximum shear stress in MPa is

- (a) 110
- (b) 210
- (c) 50
- (d) 100

27. The number of points of contraflexure in a beam with both ends fixed, under uniformly distributed load is,

- (a) 0
- (b) 1
- (c) 2
- (d) 3

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28. The theory of failure (considering only strength criteria) most suitable for ductile material is
- (a) Maximum strain energy theory
  - (b) Maximum shear strain energy theory
  - (c) Maximum principal stress theory
  - (d) Maximum principal strain theory
29. Principal stresses for a point in a body are  $(-10, 0)$  and  $(100, 0)$ . Then yielding will just begin if the designer chooses a ductile material whose yield strength is (design on the basis of maximum shear stress theory)
- (a) 50 MPa
  - (b) 100 MPa
  - (c) 55 MPa
  - (d) 110 MPa
30. For a material to be incompressible its Poisson's ratio should be,
- (a) Infinite
  - (b) 1
  - (c) 0
  - (d) None of these
31. For the purpose of design as per IS:456, deflection of RC slab or beam is limited to
- (a) 0.2% of span
  - (b) 0.25% of span
  - (c) 0.4% of span
  - (d) 0.45% of span
32. The maximum permissible shear stress,  $\tau_{cmsx}$  given in IS 456 is based on,

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- (a) Diagonal tension failure
  - (b) Diagonal compression failure
  - (c) Flexural tension failure
  - (d) Flexural compression failure
33. An ordinary mild steel bar has been pre-stressed to a working stress of 200MPa. Young's modulus of steel is 200 GPa permanent negative strain due to shrinkage and creep is 0.0008. How much is the effective stress left in steel?
- (a) 184 MPa
  - (b) 160 MPa
  - (c) 40 MPa
  - (d) 16 MPa
34. As compared to working stress method of design, limit state method takes concrete to
- (a) A higher stress level
  - (b) A lower stress level
  - (c) The same stress level
  - (d) Sometimes higher but generally lower stress level
35. In limit state design, the maximum limit imposed by IS 456 on the redistribution of moments in statically indeterminate beams is
- (a) 10%
  - (b) 15%
  - (c) 20%
  - (d) 30%
36. For a rectangular footing, for a column of size  $300 \times 500$  mm subjected to a load of 1200 kN, net area which resist the punching is, (depth of footing 300mm)
- (a)  $0.84 \text{ m}^2$

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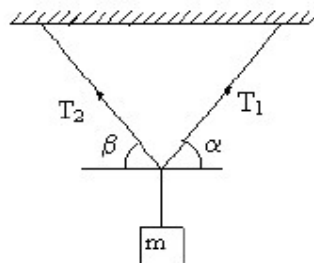
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- (b)  $1\text{m}^2$   
 (c)  $0.42\text{ m}^2$   
 (d)  $0.5\text{ m}^2$
37. If the span of beam is 18m, calculate minimum depth required by simply supported beam,  
 (a) 4500mm  
 (b) 9000mm  
 (c) 1620mm  
 (d) 2020mm
38. A simply supported beam is considered as a deep beam if the ratio of effective span to overall depth is less than,  
 (a) 1  
 (b) 4  
 (c) 3  
 (d) 2
39. A body of mass  $m$  is suspended by two strings making angles  $\alpha$  and  $\beta$  with horizontal. The tension  $T_2$  in the string is\_\_\_\_\_ (refer below figure)



- (a)  $\frac{mg \cos \alpha}{\sin(\alpha + \beta)}$                       (b)  $\frac{mg \sin \alpha}{\cos(\alpha + \beta)}$   
 (c)  $mg \frac{\cos \alpha}{\cos \beta}$                       (d)  $mg \frac{\sin \alpha}{\sin \beta}$

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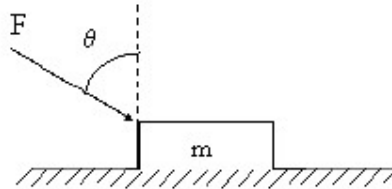
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40. A block placed on a horizontal surface is being pushed by a force  $F$  making an angle  $\theta$  with vertical. If the coefficient of friction is  $\mu$ , how much force is needed to get the block just started ( $\tan \theta > \mu$ )



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

41. A ball is thrown from a field with a speed of  $12 \frac{m}{s}$  at an angle of  $45^\circ$  with the horizontal. The distance it will hit the field again is at \_\_\_\_\_ (m).

[Take  $g = 10 \frac{m}{s^2}$ ]

- (a) 13.1    (b) 14.4    (c) 7.2    (d) 28.8

42. A force  $F = (10 + 0.5x)$  acts on a particle in x-direction, where  $F$  is in Newton and  $x$  in meter. The work done by this force during a displacement from  $x = 0$  to  $x = 2m$  is \_\_\_\_\_ J.

- (a) 13    (b) 18    (c) 21    (d) 32

43. The sum of magnitudes of two forces acting at a point is 16N. If their resultant is normal to the smaller force and has a magnitude of 8N, then the forces are

- (a) 6N, 10N    (b) 8N, 8N    (c) 4N, 12N    (d) 2N, 14N

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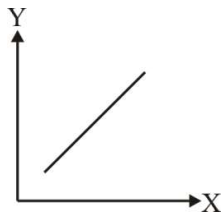
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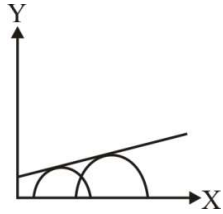
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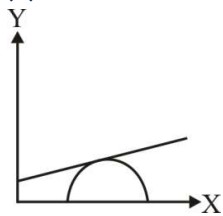
44. The minimum and maximum dry unit weight of a sand to be 14.71 and 16.68 kN/m<sup>3</sup> respectively. The dry unit weight corresponding to a relative density of 50% will be
- (a) 18.65 kN/m<sup>3</sup>
  - (b) 16.65 kN/m<sup>3</sup>
  - (c) 15.65 kN/m<sup>3</sup>
  - (d) 16.0 kN/m<sup>3</sup>
45. A masonry dam has previous sand as foundation. If a factor of safety 3 is required against boiling, maximum permissible upward gradient will be. (For the sand porosity,  $n = 50\%$  and  $G_s = 2.8$ )
- (a) 0.33
  - (b) 0.25
  - (c) 0.30
  - (d) 1.00
46. An excavation made in saturated, soft clay ( $\phi_c = 0$ ) with its side more or less vertical. When the depth of excavation reached 6m, the sides caved in. The value of cohesion of the soil will be (Take unit weight of clay = 20 kN/m<sup>3</sup>)
- (a) 20 kN/m<sup>3</sup>
  - (b) 30 kN/m<sup>3</sup>
  - (c) 40 kN/m<sup>3</sup>
  - (d) 50 kN/m<sup>3</sup>
47. For a sandy soil, the angle of internal friction is 30°. If the major principal stress is 50kN/m<sup>2</sup> at failure, then the corresponding minor principal stress (in kN/m<sup>2</sup>) will be
- (a) 12.2
  - (b) 16.66
  - (c) 20.8
  - (d) 27.2
48. Which one of the following diagrams figure correctly illustrates the Mohr's stress conditions of unconfined shear test on cohesive soil? (X-axis → Normal Stress, Y-axis → Shear stress)
- (a)



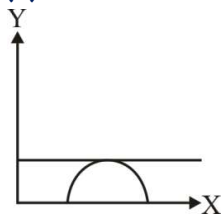
(b)



(c)



(d)



49. Logarithm of time fitting method is used to determine

- (a)  $T_v$ , time factor
- (b)  $a_v$ , coefficient of compressibility
- (c)  $c_v$ , coefficient of consolidation
- (d)  $m_v$ , coefficient of volume compressibility

50. Consolidation is soils,

- (a) is a function of the total stress
- (b) does not depend on the present stress
- (c) does not depend on the past applied stress
- (d) is a function of the effective stress

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c	b	b	b	c	d	b	b	c	b
11	12	13	14	15	16	17	18	19	20
d	c	a	a	b	d	b	c	c	b
21	22	23	24	25	26	27	28	29	30
c	d	a	b	a	c	c	b	d	d
31	32	33	34	35	36	37	38	39	40
c	b	c	a	d	a	c	d	a	b
41	42	43	44	45	46	47	48	49	50
b	c	a	c	c	d	b	d	c	d

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