

Civil Engg.-V

BIHAR PUBLIC SERVICE COMMISSION  
**B P S C**

Question paper  
and  
solutions



**ENGINEERS ACADEMY<sup>®</sup>**

Your GATEway to Professional Excellence

IES • GATE • PSUs • JTO • IAS • NET

 [www.engineersacademy.org](http://www.engineersacademy.org)

 + 91-80944 41777

1. A clear dry sand sample is tested in direct shear test. The normal stress and the shear stress at failure are both equal to  $120 \text{ kN/m}^2$ . The angle of shearing resistance of the sand will be  
(a) 25 degree (b) 35 degree  
(c) 45 degree (d) 55 degree
2. An initial cross-sectional area of a clay sample was  $15 \text{ cm}^2$ . The failure strain was 25% in an unconfined compression test. The corrected area of the sample at failure would be  
(a)  $15 \text{ cm}^2$  (b)  $20 \text{ cm}^2$   
(c)  $25 \text{ cm}^2$  (d)  $30 \text{ cm}^2$
3. Under a given load, a clay layer attains 30% degree of consolidation in 100 days. The time taken by the same clay layer to attain 60% degree of consolidation will be  
(a) 1600 days (b) 800 days  
(c) 400 days (d) 200 days
4. For a sandy soil, the angle of internal friction is 30 degree. If the major principal stress is  $50 \text{ kN/m}^2$  at failure, then the corresponding minor principal stress (in  $\text{kN/m}^2$ ) will be  
(a) 12.2 (b) 16.66  
(c) 20.8 (d) 27.2
5. The factor of safety of an infinite slope in a sand deposit is found to be 1.732. The angle of shearing resistance of the sand is 30 degree. The average slope of the sand deposit is given by  
(a)  $\sin^{-1}(0.333)$  (b)  $\cos^{-1}(0.252)$   
(c)  $\tan^{-1}(0.333)$  (d)  $\cot^{-1}(0.621)$
6. The maximum compressive stress in concrete for design purposes is based on a partial safety factor of  
(a) 1.15 (b) 1.50  
(c) 1.85 (d) 2.20
7. The creep strains are  
(a) Caused due to dead loads only  
(b) Caused due to live loads only  
(c) Caused due to both dead loads and live loads  
(d) Independent of loads
8. Due to shrinkage stresses, simply supported beam having reinforcement only at the bottom tends of deflect.  
(a) Downward  
(b) Upward  
(c) Downward or upward  
(d) None of the above
9. In a spherical dome subjected to concentrated load at crown or uniformly distributed load, the meridional force is always.  
(a) Zero  
(b) Tensile  
(c) Compressive  
(d) Tensile or compressive
10. Normally prestressing wires are arranged in the  
(a) Upper part of the beam  
(b) Lower part of the beam  
(c) Centre  
(d) Anywhere
11. The purpose of lateral ties in short RC column is to  
(a) Avoid buckling of longitudinal bars  
(b) Facilitate construction  
(c) Facilitate compaction of concrete  
(d) Increase the load carrying capacity of the columns
12. The side face reinforcement, if required in a T-beam will be  
(a) 0.1% of the web area  
(b) 0.15% of the web area  
(c) 0.2% to 0.3% of the web area depending upon the breadth of the web  
(d) Half the longitudinal reinforcement
13. Deep beams are designed for  
(a) Shear force only  
(b) Bending moment only  
(c) Both shear force and bending moment  
(d) Bearing



14. The bending moment at the edges of a square vertical bunker of side length  $l$  due to a lateral pressure  $p$  per unit area is
- (a)  $pl^2 / 12$                       (b)  $pl^2 / 10$   
(c)  $pl^2 / 16$                       (d)  $pl^2 / 11$
15. The minimum clear covers (in mm) to the main still bars in slab, beam, column and footing are respectively
- (a) 10, 15, 20, 25  
(b) 15, 25, 40, 75  
(c) 20, 25, 30, 40  
(d) 20, 35, 40, 75
16. The main reinforcement of an RC slab consists of 10 mm bars at 10 cm spacing. If it is desired to replace 10 mm bars by 12 mm bars, then the spacing of 12 mm bars should be
- (a) 12.0 cm                      (b) 14.0 cm  
(c) 14.4 cm                      (d) 16.0 cm
17. The minimum pitch of the rivets shall not be less than
- (a)  $1.5d$                       (b)  $2.0d$   
(c)  $2.5d$                       (d)  $3.0d$
18. A steel beam supporting loads from the floor slabs as well as from wall is termed as
- (a) stringer beam                      (b) lintel beam  
(c) spandrel beam                      (d) header beam
19. The channels or angles in the compression chords of the steel truss girder bridges are turned outward in order to increase
- (a) Cross-sectional area  
(b) Section modulus  
(c) Torsional constant  
(d) Radius of gyration
20. The angle dispersion of a concentrated load on the flange to the web plate of a steel beam is
- (a) 90 degree with the horizontal  
(b) 60 degree with the vertical  
(c) 45 degree with the horizontal  
(d) 30 degree with the vertical
21. A welded steel plate girder consisting of two flange plates of 350 mm  $\times$  16 mm and web plate of 1000 mm  $\times$  6 mm requires.
- (a) No stiffeners  
(b) Vertical stiffeners  
(c) Immediate vertical stiffeners  
(d) Vertical and horizontal stiffeners
22. The absolute maximum bending moment in a simply supported beam of span 20 m due to moving u.d.l. of 4 kN/m spanning over 5 m is
- (a) 87.5 kNm at the support  
(b) 87.5 kNm near the mid-point  
(c) 3.5 kNm at the midpoint  
(d) 87.5 kNm at the midpoint
23. In a two-hinged arch, an increase in temperature induces
- (a) No bending moment in the arch rib  
(b) The uniform bending moment in the arch rib  
(c) The maximum bending moment at the crown  
(d) The minimum bending moment at the crown
24. A symmetrical two-hinged parabolic arch when subjected to a uniformly distributed load on the entire horizontal span, is subjected to
- (a) Radial shear alone  
(b) Normal thrust alone  
(c) Normal thrust and bending moment  
(d) Normal thrust, radial shear and bending moment
25. A fixed beam of span  $L$  is carrying a point load  $P$  at its mid-span. If the moment of inertia of the middle half-length is two times that of the remaining length, then the fixed end moments will be
- (a)  $PL/32$                       (b)  $5PL/48$   
(c)  $3PL/32$                       (d)  $5PL/32$
26. The influence line for horizontal thrust in two-hinged parabolic arch is
- (a) Parabolic                      (b) Cubic  
(c) Triangular                      (d) Rectangular





**ENGINEERS ACADEMY**<sup>®</sup>

Your GATEway to Professional Excellence

IES • GATE • PSUs • JTO • IAS • NET

**ESE**

Engineering Services Examination

**GATE**

Graduate Aptitude Test in Engineering

**SSC-JE**

Staff Selection Commission - Junior Engineer

**RRB-JE**

Railway Recruitment Board - Junior Engineer

**PSUs**

Public Sector Undertakings

**ESE + GATE +  
PSUs-2020**

Regular Classroom Batch

**22 May & 10 June 2019**

**SSC-JE +  
RRB-JE(CBT)**

Regular Classroom Batch

**29 May & 17 June 2019**

# ADMISSION ANNOUNCEMENT

Streams : CE | EE | ME | PI | EC | IN

JOIN AS A BEGINNER  
Leave as an  
**Achiever**

**Delhi Saket Center :**

Khasra 262, Westend Marg,  
Near Garden of Five Senses,  
Saket, New Delhi 110030

**Cell : +91-7239993777**

**Delhi Mukherjee Nagar Center**

H N- 712, Ground Floor,  
Opp. Batra Cinema  
Dr. Mukherjee Nagar, Delhi-110009

**Cell # 0723 9992777**

 + 91-80944 41777

 [www.engineersacademy.org](http://www.engineersacademy.org)

27. For a single-point load  $W$  moving on symmetrical 3-hinged parabolic arch of span  $L$ , the maximum sagging moment occurs at a distance  $x$  from ends. The value of  $x$  is
- (a)  $0.211L$  (b)  $0.25L$   
(c)  $0.234L$  (d)  $0.5L$
28. In which of the following truss members the stress depends upon whether the load is moving on top chord or bottom chord?
- (a) Top chord and bottom chord  
(b) Verticals  
(c) Diagonals  
(d) Verticals and diagonals
29. Which of the following methods of structural analysis is a force method?
- (a) Slope deflection method  
(b) Column analogy method  
(c) Moment distribution method  
(d) None of the above
30. Which of the following methods of structural analysis is a displacement method?
- (a) Three-moment equation  
(b) Column analogy method  
(c) Moment distribution method  
(d) None of the above
31. In the displacement method of structural analysis, the basic unknown are
- (a) Displacement  
(b) Forces  
(c) Displacement and forces  
(d) None of the above
32. The fixed support in a real beam becomes in the conjugate beam at
- (a) Roller support (b) Hinged support  
(c) Fixed support (d) Free end
33. The width of the analogous column in the method of column analogy is
- (a)  $2/EI$  (b)  $1/EI$   
(c)  $1/2EI$  (d)  $1/4EI$
34. A simply supported beam deflects by 5 mm when it is subjected to a concentrated load of 10 kN at its centre. What will be the deflection in a 1/10 model of the beam, if the model is subjected to a 1 kN load at its centre?
- (a) 5 mm (b) 0.5 mm  
(c) 0.05 mm (d) 0.005 mm
35. The deformation of a spring produced by a unit load is called
- (a) Stiffness  
(b) Flexibility  
(c) Influence coefficient  
(d) Unit strain
36. The castigliano's 2nd theorem can be used to compute deflections
- (a) In statically determinate structures only  
(b) For any type of structure  
(c) At the point under the load only  
(d) For beam and frames only
37. For a 2-hinged arch, if one of the supports settles down vertically, then the horizontal thrust
- (a) Is increased  
(b) Is decreased  
(c) Remains unchanged  
(d) Becomes zero
38. The maximum bending moment due to a train of wheel loads on a simply supported girder
- (a) Always occurs at the centre of span  
(b) Always occurs under a wheel load  
(c) Never occurs under a wheel load  
(d) None of the above
39. The unit of coefficient of consolidation is
- (a)  $\text{cm}^2 / \text{gm}$   
(b)  $\text{cm}^2 / \text{sec}$   
(c)  $\text{gm} / \text{cm}^2 / \text{sec}$   
(d)  $\text{gm-cm} / \text{sec}$



# GATE+PSUs-2020

## Regular Classroom Programme

### Features

1. Classes on Monday to Sunday.
2. 800-900 Hours Course Duration.
3. Pre Exam and Post Exam Guidance.
4. Study Materials and Online & Offline Test Series.
5. Interview Guidance Programme.
6. Subjects Taught from Basic to Advanced Level.
7. Real Test Environment available and Surplus practice and Test Session.
8. Experienced and Dedicated Faculty.
9. Library facility (Reference & Standard Books).
10. Orientation Towards concept Building instead of Cramming.

### Study Materials

1. Classes on Monday to Sunday.
2. 800-900 Hours Course Duration.
3. Pre Exam and Post Exam Guidance.
4. Study Materials and Online & Offline Test Series.
5. Interview Guidance Programme.
6. Subjects Taught from Basic to Advanced Level.
7. Real Test Environment available and Surplus practice and Test Session.
8. Experienced and Dedicated Faculty.
9. Library facility (Reference & Standard Books).
10. Orientation Towards concept Building instead of Cramming.

### Classroom Test

Engineers Academy provides the complete Classroom Test of each and every Technical and Non-Technical Subjects up to the level of GATE and PSUs.

- Totally Based on Exam Pattern
- OMR Based Tests
- Complete detailed Solution of Test.
- Doubt Sessions of All Test.

### Test Series

Engineers Academy provides the complete online and offline test series each and every Technical and Non-Technical Subjects up to the level of GATE and PSUs.

1. GATE-2020 Online Test Series.

## GATE TOPPERS 2019



DUSHYANT SINGH  
TF: AIR-1



SPARSH NATH SAXENA  
TF: AIR-2



NIPUN MITTAL  
CSE: AIR-3



RAJAT  
ES: AIR-5



SATANTAM BHATTACHARYA  
EE: AIR-5



RAMESH KAMULLA  
IE: AIR-6



MAYANK SAHAY  
TF: AIR-7



SUBHAM TIWARI  
TF: AIR-10



NISHTHA SINGH  
TF: AIR-11



NIKHIL PURI  
CH: AIR-13



SATEESH KUMAR  
TF: AIR-21



ARSHIF  
IE: AIR-31



SHIBANPREET  
ME: AIR-32



VINAY GAUTAM  
EE: AIR-39



PIYUSH GUPTA  
TF: AIR-53



SRIVASTAV  
CH: AIR-63



PANKAJ BHARDWAJ  
IE: AIR-64



SUGAM AGARWAL  
CE: AIR-70



VIPUL KR. MISHRA  
PE: AIR-73



SONALI MANGAL  
EE: AIR-97



ALOK SINGH  
TF: AIR-97



MANJEET CHOUDHARY  
EE: AIR-125



KM. POOJA MAURYA  
TF: AIR-129



MENAK JAIN  
EE: AIR-134



RAJNEESH KR.  
EE: AIR-167



YOGITA KACHHWAH  
EE: AIR-185



PRADEEP PATIDAR  
IE: AIR-229



CHANDRIMA  
EE: AIR-235



VISHAL TRIPATHI  
CH: AIR-256



MAYANK SHARMA  
EE: AIR-295

40. Which of the following gives the correct decreasing order of the densities of a soil sample?
- Saturated, submerged, wet, dry
  - Saturated, wet, submerged, dry
  - Saturated, wet, dry, submerged
  - Wet, saturated, submerged, dry
41. For sampling natural sands and other soft and wet soils satisfactorily, the most suitable soil sampler is
- Open drive thin-walled tube sampler
  - Standard split-spoon sampler
  - Stationary piston sampler
  - Rotary sampler
42. During seepage through an earth mass, the direction of seepage is
- Parallel to the equipotential lines
  - Perpendicular to the stream-lines
  - Perpendicular to the equipotential lines
  - Along the direction of gravity
43. A sample of clay and a sample of sand have the same specific gravity and void ratio. Their permeabilities would differ because.
- Their porosities would be different
  - Their degrees of saturation would be different
  - Their densities would be different
  - The size ranges of their voids would be different
44. In a saturated clay layer undergoing consolidation with single drainage at its top, the pore water pressure would be the maximum at its
- Top
  - Middle
  - Bottom
  - Top as well as bottom
45. A saturated clay stratum of thickness 10 m, bounded on top and bottom by medium coarse sand layers, has a coefficient of consolidation of  $0.002 \text{ cm}^2/\text{s}$ . If this stratum is subjected to loading, It is likely that it would undergo 50% of its primary consolidation in
- 1136 days
  - 227 days
  - 284 days
  - 568 days
46. Which of the following parameters can be used to estimate the angle of internal friction of sandy soil?
- Particle size
  - Roughness of particle
  - Particle size distribution
  - Density index
47. A cantilever sheet pile derives its stability from
- Lateral resistance of soil
  - Self-weight
  - The dead man
  - The anchor rod
48. Deflection of a sheet pile in a braced cut
- Increases from top to bottom
  - Decreases from top to bottom
  - Increases from top and then decreases
  - Decreases from top and then increase
49. The time  $t$  required for attaining a certain degree of consolidation of a clay layer is proportional to
- $H^2$  and  $C_v$
  - $H^2$  and  $1/C_v$
  - $1/H^2$  and  $C_v$
  - $1/H^2$  and  $1/C_v$
50. The static cone penetration test and a standard penetration test are performed on a soil at a certain depth. The value of static cone penetration test is 8 MPa and the N value is 20. The soil met with at that depth is
- Sandy silt
  - Clay-silt mixture
  - Sand and gravel mixture
  - Medium dense sand



Follow us :     

## Online Test Series

Following are the features of online test series of engineers academy

1. Chapter wise test
2. Cumulative part test
3. Full mock test
4. Category wise analysis and ranking.
5. Instant results after every test
6. Progress report



Online Test Series for  
**RRB-JE**  
Railway Recruitment Boards - Junior Engineer  
**1<sup>st</sup> Stage (CBT)**



for Civil, Electrical, Mechanical and Electronics and Computer Science Engineering

Syllabus : Mathematics • General Awareness General Intelligence & Reasoning • General Science

Buy Now : [www.onlineengineersacademy.org](http://www.onlineengineersacademy.org) • Helpline : 7665505666



Online Test Series for  
**RRB-JE**  
Railway Recruitment Boards - Junior Engineer  
**2<sup>nd</sup> Stage (CBT)**



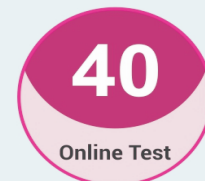
for Civil, Electrical, Mechanical and Electronics and Computer Science Engineering

Syllabus: General Awareness • Physics & Chemistry Basics of Computer and applications • Basics of Environment and Pollution Control • Technical Syllabus

Buy Now : [www.onlineengineersacademy.org](http://www.onlineengineersacademy.org) • Helpline : 7665505666



Online Test Series for  
**SSC-JE**  
Staff Selection Commission - Junior Engineer  
*Preliminary Exam*  
for Civil, Electrical & Mechanical Engineering



Syllabus : General Intelligence & Reasoning • General Awareness General Engineering (Civil, Electrical and Mechanical Engineering)

Buy Now : [www.onlineengineersacademy.org](http://www.onlineengineersacademy.org) • Helpline : 7665505666



Online Test Series for  
**GATE-2020**



For CE, EE, EC, ME, CH  
CSE, IN, PI and TF

Buy Now : [www.onlineengineersacademy.org](http://www.onlineengineersacademy.org) • Helpline : 7665505666



# SSC-JE+RRB-JE (CBT-2)

## Regular Classroom Programme

### Features

1. Classes on Monday to Sunday.
2. 550-600 Hours Course Duration.
3. Pre Exam and Post Exam Guidance.
4. Study Materials and Online & Offline Test Series.
5. Interview Guidance Programme.
6. Subjects Taught from Basic to Advanced Level.
7. Real Test Environment available and Surplus practice and Test Session.
8. Experienced and Dedicated Faculty.
9. Library facility (Reference & Standard Books).
10. Orientation Towards concept Building instead of Cramming.

### Study Materials

1. Theory and Objective books of Technical Subjects.
2. General Studies Book : History, Economics, Polity ,Life Science, Geography & Current Affairs.
3. Reasoning: Theory and Previous Year Solved Question Papers.
4. SSC JE Objective Previous Year Solved Papers
5. SSC JE Conventional Previous Year Solved Papers
6. Current Affairs & G. K. Books.
7. MCQ Book of Various PSUs Exams Books.

### Classroom Test

Engineers Academy provides the complete Classroom Test of each and every Technical and Non-Technical Subjects up to the level of SSC-JE & State-AE/JE.

- Totally Based on Exam Pattern
- OMR Based Tests
- Complete detailed Solution of Test.
- Doubt Sessions of All Test.

### Test Series

Engineers Academy provides the complete online and offline test series each and every Technical and Non-Technical Subjects up to the level of SSC-JE & RRB-JE

1. SSC JE Prelims Online Test Series.
2. SSC JE Mains Offline Test Series.
3. RRB-JE Online Test Series.

## SSC-JE TOPPERS 2017



RAHUL AGRAWAL  
CE-CPWD



ARUNDEEP SINGH  
CE-CPWD



RAJAT GAUR  
CE-MES



PANKAJ KUMAR  
CE-CPWD



NEERAJ SINGH  
CE-MES



BHOOP SINGH  
CE-MES



VIPUL MITTAL  
CE-MES



HITESH K. SAPAWAT  
CE-CPWD



RAVI SHANKAR BAIRWA  
CE-MES



DIGVIJAY S. RANAWAT  
CE-MES



PANKAJ KUMAR  
CE-CPWD



PIYUSH RATHORE  
CE-CPWD



HEMANT SINGH  
CE-MES



AKASH SARAN  
CE-CPWD



RAHUL KUMAR  
CE-NTRO



KAVITA NAGAR  
EE-MES



VINOD K. SHARMA  
CE-MES



SUNIL KUMAWAT  
CE-CPWD



CHETRAM BAIRWA  
CE-MES



PRAHLAD GUPTA  
ME-MES



PRASHANT KUMAR  
CE-MES



HIMANSHU MEENA  
CE-CPWD



MANOJ KUMAR KHEJAR  
CE-NTRO



AJEET KUMAR  
ME-MES



NITIN KU. MEENA  
CE-CPWD



DEVENDRA S. NARUKA  
ME-MES



KAILASH C. MEENA  
CE-CPWD



PRAVESH KUMAR  
CE-CPWD



HARSHIT KUMAR  
CE-CPWD



VIKAS MANTRI  
CE-NTRO

## ANSWERS KEY

1. **Ans. (c)**

$$\tau_f = \sigma_f = 120$$

$$c = 0$$

$$f = ?$$

We know that

$$\tau_f = c + \sigma_f \times \tan\phi$$

$$\Rightarrow 120 = 0 + 120 \times \tan\phi$$

$$\Rightarrow \tan\phi = 1$$

$$\therefore \phi = 45^\circ$$

2. **Ans. (b)**

Initial cross-sectional area = 15 cm<sup>2</sup>

failure strain = 25 %

$\therefore$  corrected area of the sample at

$$\text{failure} = \frac{15}{1 - 0.25}$$

$$= 20 \text{ cm}^2$$

3. **Ans. (c)**

$$T_v = \frac{C_v \cdot t}{H^2}$$

Here,  $C_v$  and  $H$  remains constant

$T_v \propto t$  and  $T_v \propto U$

$$\therefore \frac{t_1}{t_2} = \left( \frac{U_1}{U_2} \right)^2$$

$$\Rightarrow \frac{100}{t_2} = \left( \frac{30}{60} \right)^2$$

$$\Rightarrow t_2 = 400 \text{ days}$$

4. **Ans. (b)**

Here,  $\sigma_1 = 50 \text{ kN/m}^2$

$$c = 0$$

$$\phi = 30^\circ$$

We know that :

$$\sigma_1 = \sigma^2 \cdot \tan^2(45 + \phi/2) + 2 \cdot C \cdot \tan(45 + \phi/2)$$

$$\Rightarrow 50 = \sigma_3 \cdot \tan(45 + 30/2) + 0$$

$$\Rightarrow \sigma_3 = 16.66 \text{ kN/m}^2$$

5. **Ans. (c)**

$$\text{FOS} = 1.732$$

$$\phi = 30^\circ$$

$$i = ?$$

We know that : for infinite slope in a sand deposit

$$\text{FOS} = \frac{\tan\phi}{\tan i}$$

$$\Rightarrow 1.732 = \frac{\tan 30^\circ}{\tan i}$$

$$\tan i = \frac{1/\sqrt{3}}{1.732}$$

$$\tan i = 0.333$$

$$i = \tan^{-1}(0.333)$$

6. **Ans. (b)**

7. **Ans. (a)**

8. **Ans. (a)**

9. **Ans. (c)**

10. **Ans. (b)**

11. **Ans. (a)**

12. **Ans. (a)**

13. **Ans. (b)**

14. **Ans. (a)**

15. **Ans. (b)**

16. **Ans. (c)**

17. **Ans. (c)**

Explanation :

(i) For proper installation of rivets

(ii) to reduce the stress concentration rivets shall not be placed less than 2.5 times  $d$

18. **Ans. (a)**

19. **Ans. (d)**

**Reason :**

More the radius of gyration more will be load carrying capacity

20. *Ans. (c)*

21. *Ans. (b)*

$$\text{As } \frac{d}{t} = \frac{1000}{\sigma} = 166.67$$

$$85 < \frac{d}{t} \leq 200$$

Vertical stiffeners are required.

22. *Ans. (d)*

23. *Ans. (c)*

24. *Ans. (b)*

25. *Ans. (b)*

26. *Ans. (a)*

27. *Ans. (a)*

28. *Ans. (c)*

29. *Ans. (b)*

30. *Ans. (c)*

31. *Ans. (a)*

32. *Ans. (d)*

33. *Ans. (b)*

34. *Ans. (c)*

35. *Ans. (b)*

36. *Ans. (b)*

37. *Ans. (b)*

38. *Ans. (b)*

39. *Ans. (b)*

40. *Ans. (c)*

41. *Ans. (c)*

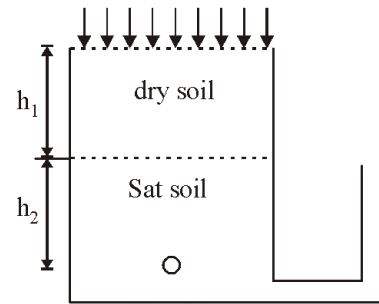
42. *Ans. (c)*

43. *Ans. (d)*

44. *Ans. (c)*

Pore water pressure

$$u = \gamma_w \cdot h_2$$



Hence, Pore water pressure will be maximum at its bottom

45. *Ans. (c)*

$$T_v = 0.196$$

$$C_v = 0.002 \text{ cm}^2/\text{s}$$

$$H = \frac{10}{2} = 5\text{m} = 500 \text{ cm}$$

$$t = ?$$

We know that :

$$T_v = \frac{C_v \cdot t}{H^2}$$

$$0.196 = \frac{0.002 \times t}{(500)^2}$$

$$t = \frac{0.196}{0.002} \times (500)^2$$

$$t = 245 \times 10^5 \text{ sec}$$

$$t = \frac{2.45 \times 10^7}{24 \times 60 \times 60} \times \text{days}$$

$$t = 283.56 \approx 284 \text{ days}$$

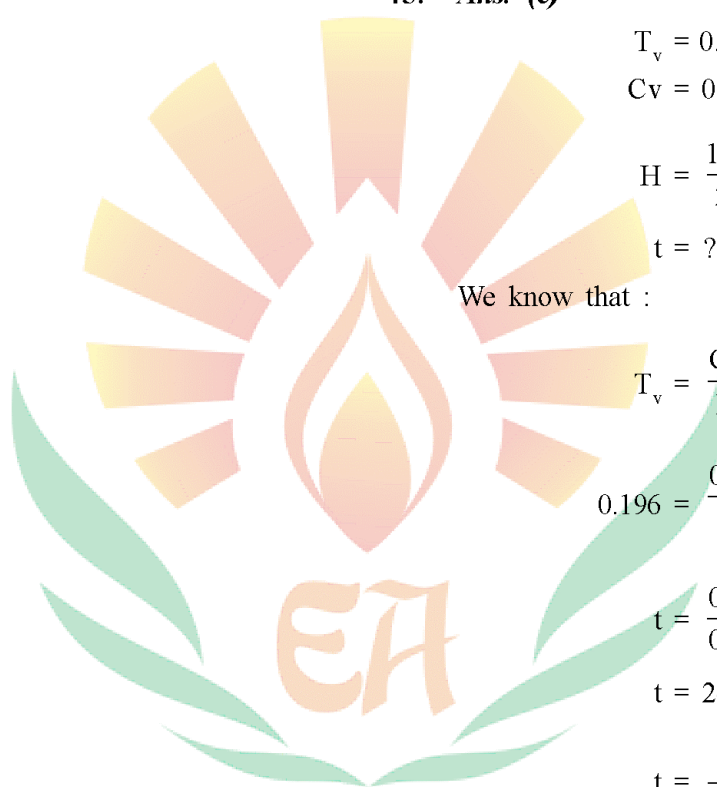
46. *Ans. (d)*

47. *Ans. (a)*

48. *Ans. (c)*

49. *Ans. (b)*

50. *Ans. (d)*



# Study Centers

<p><b>JAIPUR – PRATAP NAGAR CENTER</b> 100-102, Ram Nagar, Bambala Puliya, Toll Tax, Pratap Nagar, Tonk Road, Jaipur-302033 (Rajasthan) • Tel # 07737 040 911</p>	<p><b>DELHI MUKHERJEE NAGAR CENTER</b> H N- 712, Ground Floor, Opp. Batra Cinema Dr. Mukherjee Nagar, Delhi-110009 • Tel # 0723 999 2 777</p>
<p><b>JAIPUR- MAHAVEER NAGAR CENTER</b> S-52-53, Mahaveer Nagar, Behind Jaipur Hospital, Gopalpura Tonk Road, Jaipur-302018 ( Rajasthan) • Tel # 077370 40910</p>	<p><b>DELHI SAKET CENTER</b> Khasra 262, Westend Marg, Near Garden of Five Senses, Saket, New Delhi 110030 Tel # +91-7239993777</p>
<p><b>JAIPUR- SANGHI CENTER</b> EA Campus, Sanghi School, Gopalpura, Tonk Road, Jaipur-302018 ( Rajasthan) • Tel # 098875 82200</p>	<p><b>PATIALA CENTER</b> SCB-7, Illrd Floor, Choti Baradari, Patiala (Punjab)• Tel # 09855273076</p>
<p><b>AJMER CENTER</b> Shiksha Tower, Behind MRF Showroom, Adarsh Nagar, Ajmer - 305002 (Rajasthan) • Tel # 097994 94491</p>	<p><b>KANPUR CENTER</b> Basement, Trilok Plaza, Lakhampur, Behind Gurdev Place, Kanpur-208024 (U.P.) • Tel # 0723 999 2222</p>
<p><b>KOTA CENTER</b> P.No.-7A, 18 Second Floor, Near Mahaveer Nagar-3 Circle, Rangbari Road, Kota-324005 • Tel # 082902 56340</p>	<p><b>LUCKNOW CENTER</b> 1st Floor, Corporation Bank, Sector-E, Aliganj, Lucknow-226024 (U.P.) •Tel # 081 888 41 777</p>
<p><b>JODHPUR CENTER</b> B-4 1st Floor, Mahaveer Colony, Shivam Hospital, Bhaskar Circle, Ratanada, Jodhpur • Tel # 76655 06 888</p>	<p><b>CHANDIGARH CENTER</b> SCO 94-95, Basement &amp; Ground floor, Sec-34/A, Chandigarh (Punjab) • Tel # 09815411737</p>
<p><b>AGRA CENTER</b> Millennium Complex, Nehru Nagar , Just Behind Bhagwan Talkies , Agra -282003 (U.P.) • Tel # 0723 999 3 555</p>	<p><b>PATNA CENTER</b> 4th Floor, Magadh Naresh, Opp KFC &amp; SBI Bank, Main Road Kankarbagh, Patna- 800020 (Bihar) • Tel # 0843 444 1 777</p>
<p><b>JALANDHAR CENTER</b> Prestige Chamber, 4th Floor, CHR Group, GT Road, Bus Stand, Jalandhar- 144001 (Punjab) •Tel # 07589 44 1 777</p>	<p><b>ALLAHABAD CENTER</b> EA Campus, Opp. Ishwar Sharan College, Salori, Allahabad, UP -211004 • Tel # 0723 999 1 444</p>
<p><b>RANCHI CENTER</b> Sri Sai Tower, 5th Floor, Debuka Nursing Lane, Lalpur, Ranchi, Jharkhand - 834001 • Tel # 07239990222, 07239990333</p>	<p><b>LPU CAMPUS CENTER</b> Lovely Professional University Campus, Block-13, Room-206, G.T. Road, Phagwara-144411 (Punjab) • Tel # 09465 22 00 33</p>



## ENGINEERS ACADEMY<sup>®</sup>

Your GATEway to Professional Excellence

IES • GATE • PSUs • JTO • IAS • NET

**Corporate Office:** 100-102, Ram Nagar-B, Bambala Puliya, Toll Tax, Pratap Nagar, Jaipur-302033  
**Head Office:** S-52-53, Mahaveer Nagar, Behind Jaipur Hospital, Gopalpura, Tonk Road, Jaipur-302018

Website: [www.engineersacademy.org](http://www.engineersacademy.org) | [www.onlineengineersacademy.org](http://www.onlineengineersacademy.org) | [www.eapublications.org](http://www.eapublications.org)  
[www.eapublications.org](http://www.eapublications.org) • National Board Help Line Number: 8094441777