1. **For conducting a Standard Proctor Compaction Test, the weight of hammer (P in kg), the fall of hammer (Q in mm), the number of blows per layer (R) and the number of layers (S) required are respectively**

P	Q		R	S
(a) 5.89	550	50	50	3
(b) 4.89	450	25	25	3
(c) 3.60	310	35	35	4
(d) 2.60	310	25	25	5

2. Sheep-foot rollers are recommended for compacting

(a) granular soils
(b) cohesive soils
(c) hard rock
(d) any type of soil

4. Consider the following statements:

1. Relative compaction' is not the same as 'relative density'.
2. Vibro floatation is not effective in the case of highly cohesive soils
3. Zero air void line' and '100% saturation line' are not identical.

Of these statements
(a) 1 and 2 are correct
(b) 1 and 3 are correct
(c) 2 and 3 are correct
(d) 3 alone correct

6. Match List I (Test) with List II (Property) and select the correct answer:

List – I		List – II	
A.	Proctor Test	1.	Grain Size Analysis
B.	Vane Test	2.	Shear Strength
C.	Penetration Test	3.	Bearing Capacity
D.	Hydrometer Test	4.	Compaction

Codes :

A. A – 2, B – 4, C – 1, D – 3

B. A – 4, B – 2, C – 1, D – 3

C. A – 4, B – 2, C – 3, D – 1

D. A – 2, B – 4, C – 3, D – 1

7. Match List I (Roller type) with List II (Soil type) and select the correct answer:

List – I

A. Pneumatic roller
B. Smooth wheeled roller
C. Sheep foot roller
D. Vibratory roller

List – II

1. Cohesive and granular soils
2. Plastic soils of moderate cohesion
3. Cohesionless soils
4. Silty soils of low plasticity

Codes :

A. A – 4, B – 2, C – 1, D – 3
B. A – 3, B – 1, C – 2, D – 4
C. A – 4, B – 1, C – 2, D – 3
D. A – 3, B – 2, C – 1, D – 4

8. In a compaction test if the compacting effort is
   increased, it will result in

   (a) Increase in maximum dry density and OMC
   (b) Increase in maximum dry density but OMC remains
       unchanged
   (c) Increase in maximum dry density and decrease in OMC
   (d) NO change in maximum dry density but decrease in OMC
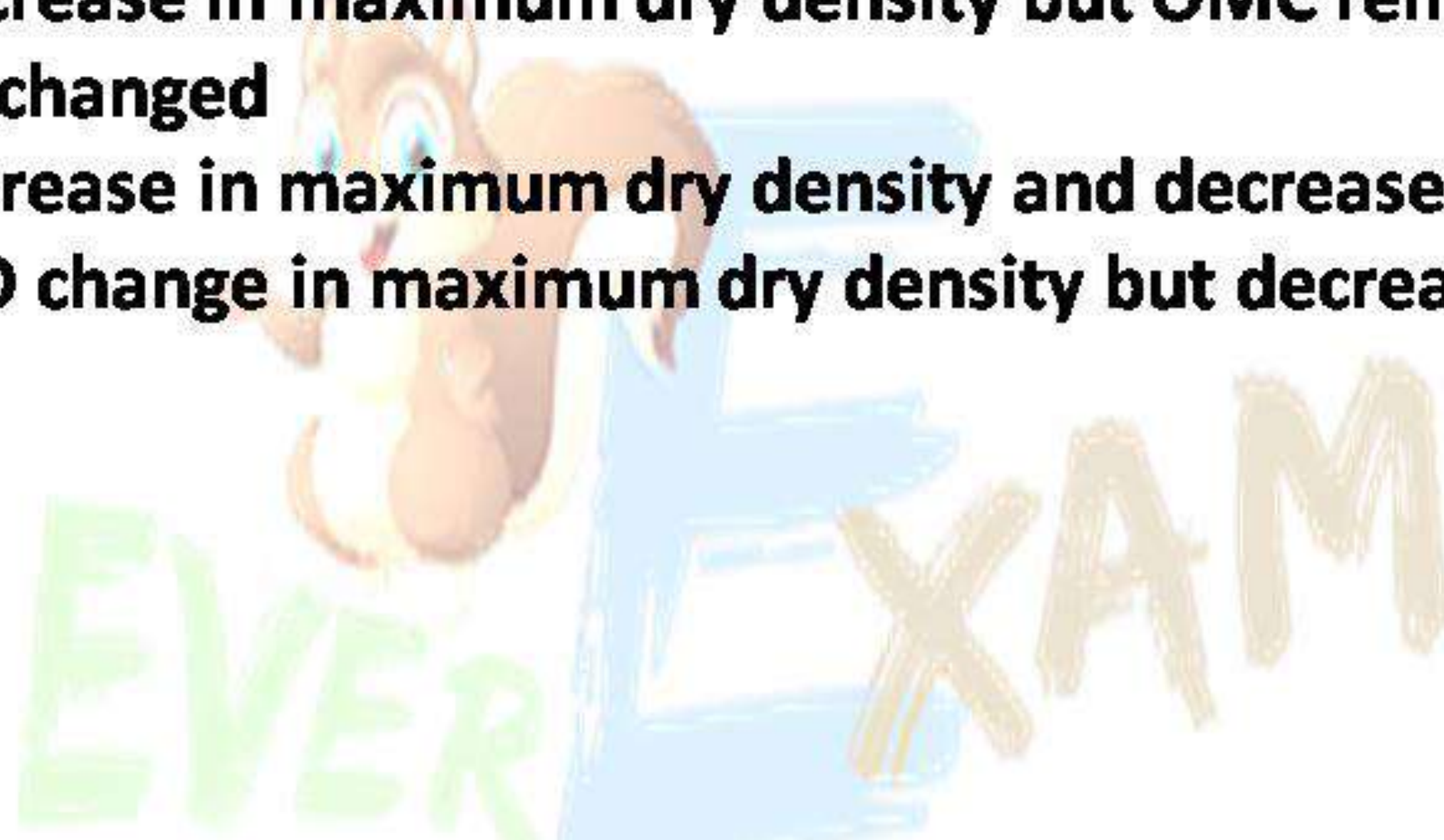
9. **Match List-I (Equipment) with List-II (Use) and select the correct answer using the codes given below:**

List – I	List – II
A. Vibratory rollers	1. To compact soils in confined areas and at corners
B. Sheep foot rollers	2. To compact road and railway embankments of sandy soils
C. Frog hammers	3. To densify sandy soils over a large area and to a larger depth
D. Vibrofloats	4. To compact clayey soils fills

Codes :

A. A – 4, B – 2, C – 1, D – 3

B. A – 4, B – 2, C – 3, D – 1

C. A – 2, B – 4, C – 1, D – 3

D. A – 2, B – 4, C – 3, D – 1

10. Soil is compacted at which one of the following when a higher compactive effort produces highest increase in dry density?

(a) Optimum water content
(b) Dry side of the optimum moisture content
(c) Wet side of the optimum moisture content
(d) Saturation moisture content

12. Match List-I (Equipment) with List-II (Purpose) and select the correct answer using the code given below the Lists:

List – I
A. Sheep foot roller
B. Frog hammer
C. Vibratory roller

Codes :
A. A – 4, B – 1, C – 2
B. A – 2, B – 1, C – 4
C. A – 4, B – 3, C – 2
D. A – 2, B – 3, C – 4

List – II
1. To densify cohesionless soils to relatively larger depths
2. To compact lumpy cohesive soil fills
3. To compact soils at corner and places where bigger rollers cannot access
4. To compact cohesionless soils of shallow depth

13. Match List I with List II and select the correct answer using the code given below the lists

List – I
A. Smooth wheel rollers
B. Sheep foot rollers
C. Pneumatic tyred rollers
D. Rammers

List – II
1. Most suitable for compacting
2. Most suited for compacting coarse grained soils
3. Used for compacting soils in confined places
4. Suitable for both cohesion less and cohesive soils

Codes :
A. A – 4, B – 3, C – 2, D – 1
B. A – 2, B – 1, C – 4, D – 3
C. A – 4, B – 1, C – 2, D – 3
D. A – 2, B – 3, C – 4, D – 1

15. The following soils are compacted at the same compactive effort in the field. Which one of the following is the correct sequence in the increasing order of their maximum dry density?

(a) Silt clay - Clay - Sand - Gravel sand clay mixture
(b) Sand - Gravel sand clay mixture - Silty clay – Clay
(c) Clay - Silty clay - Sand - Gravel sand clay mixture
(d) Sand - Gravel sand clay mixture - Clay - Silty clay

16. An increase in compaction effort will lead to which of the following?   IES-2007

    (a) Decrease in the optimum moisture content (OMC) and maximum dry density
    (b) Decrease in both the optimum moisture content (OMC) and increase in the maximum dry density
    (c) Increase in the optimum moisture .content (OM C) and decrease in the maximum dry density
    (d) Increase in both the optimum moisture content (OMC) and maximum dry density

18. Consider the following:

1. Increase in shear strength and bearing capacity
2. Increase in slope stability
3. Decrease in settlement of soil
4. Decrease in permeability

Which of the above with respect to compaction of soil is/are correct?

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

24. The field density and field moisture content of a soil can be determined by

1. Core cutter method
2. Sand replacement method
3. Proctor compaction test
4. Modified proctor compaction test

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

27. The specific gravity of a soil sample is 2.7 and its void ratio is 0.945. When it is fully saturated, the moisture content of the soil will be

(a) 25%   (b) 30%

(c) 35%   (d) 40%

28. A soil deposit has a void ratio of 1.0. If the void ratio is reduced to 0.60 by compaction, the percentage volume loss is

(a) 10%

(b) 20%

(c) 30%

(d) 40%

1. If during a permeability test on a soil sample with a falling head permeameter, equal time intervals are noted for drop of head from h, to h2 and again from h2 to h3' then which one of the following relations would hold good?

(a) $h^2_3 = h_1\ h_2$

(b) $h_2^2 = h_1\ h_3$

(c) $h_1^2 = h_2\ h_3$

(d) $(h_1 - h_2) = (h_2 - h_3)$

5. Due to rise in temperature, the viscosity and unit weight of percolating fluid are reduced to 70% and 90% respectively. Other things being constant, the change in coefficient of permeability will be
   (a) 20.0%
   (b) 28.6%
   (c) 63.0%
   (d) 77.8%

4. A bed of sand consists of three horizontal layers of equal thickness. The value of Darcy's k for the upper and lower layers is 1×10^{-2} cm/sec and that for the middle layer is 1×10^{-1} cm /see, The ratio of the permeability of the bed in the horizontal direction to that in the vertical direction is

(a) 10.0 to 1

(b) 2.8 to 1

(c) 2.0 to 1

(d) 1 to 10

7. Consider the following statements:

1. Constant head permeameter is best suited for determination of coefficient of permeability of highly impermeable soils.
2. Coefficient of permeability of a soil mass decreases with increase in viscosity of the pore fluid.
3. Coefficient of permeability of a soil mass increases with increase in temperature of the fluid.

Of these statements
(a) 1 and 2 are correct
(b) 1 and 3 are correct
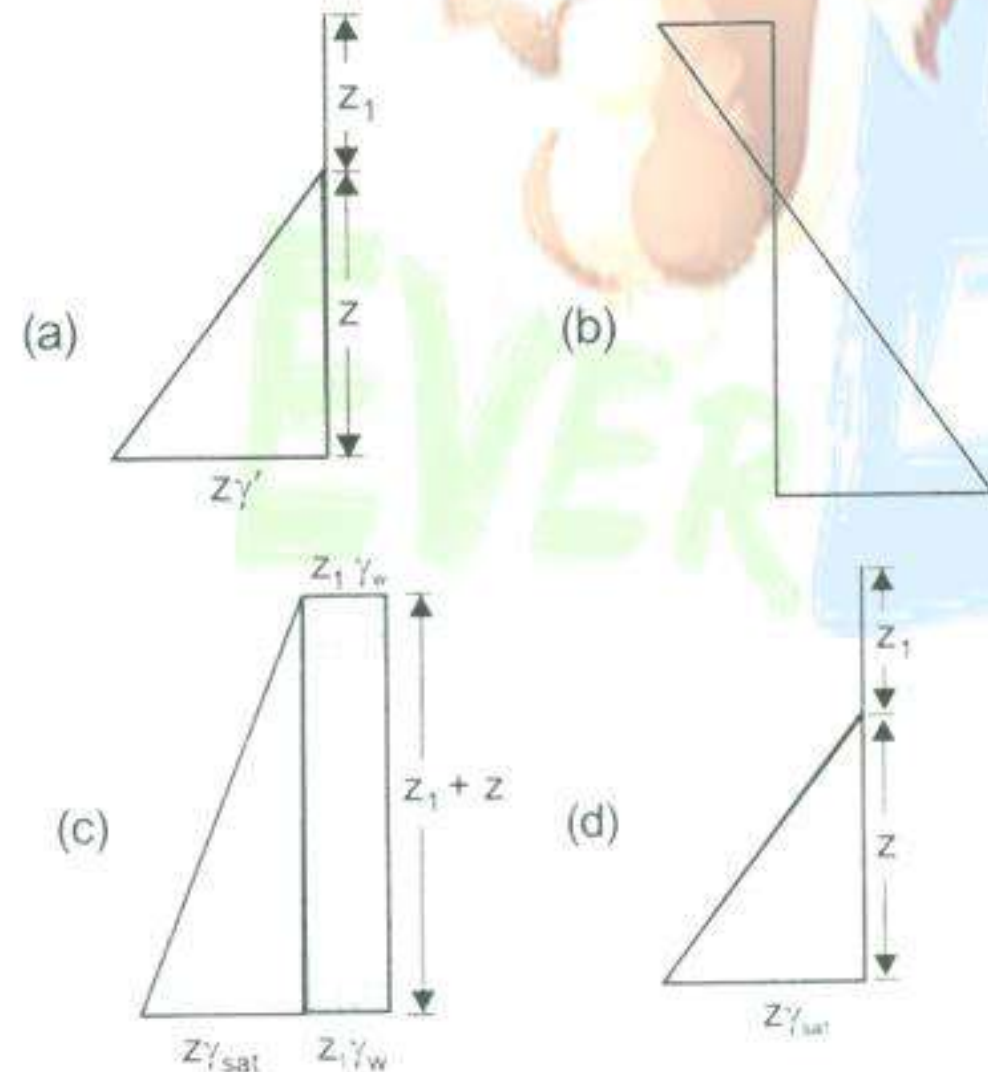(c) 2 and 3 are correct
(d) 1, 2 and 3 are correct

8. In a two-layer soil system, the top soil and bottom soil are of same thickness but the coefficient of permeability of the top soil is twice that of the bottom soil of coefficient of permeability 'k'. When horizontal flow occurs, the equivalent coefficient of permeability of the system will be

(a) 2k

(b) 1.5 k

(c) 1.25 k

(d) 1.2 k

9. Which one of the following diagrams represents the effective pressure distribution for a saturated soil mass of depth z submerged under water of height Z1 above its top level (y' = submerged density of soil Y_{sat} = saturated density of soil and Y_w = unit weight of water)?
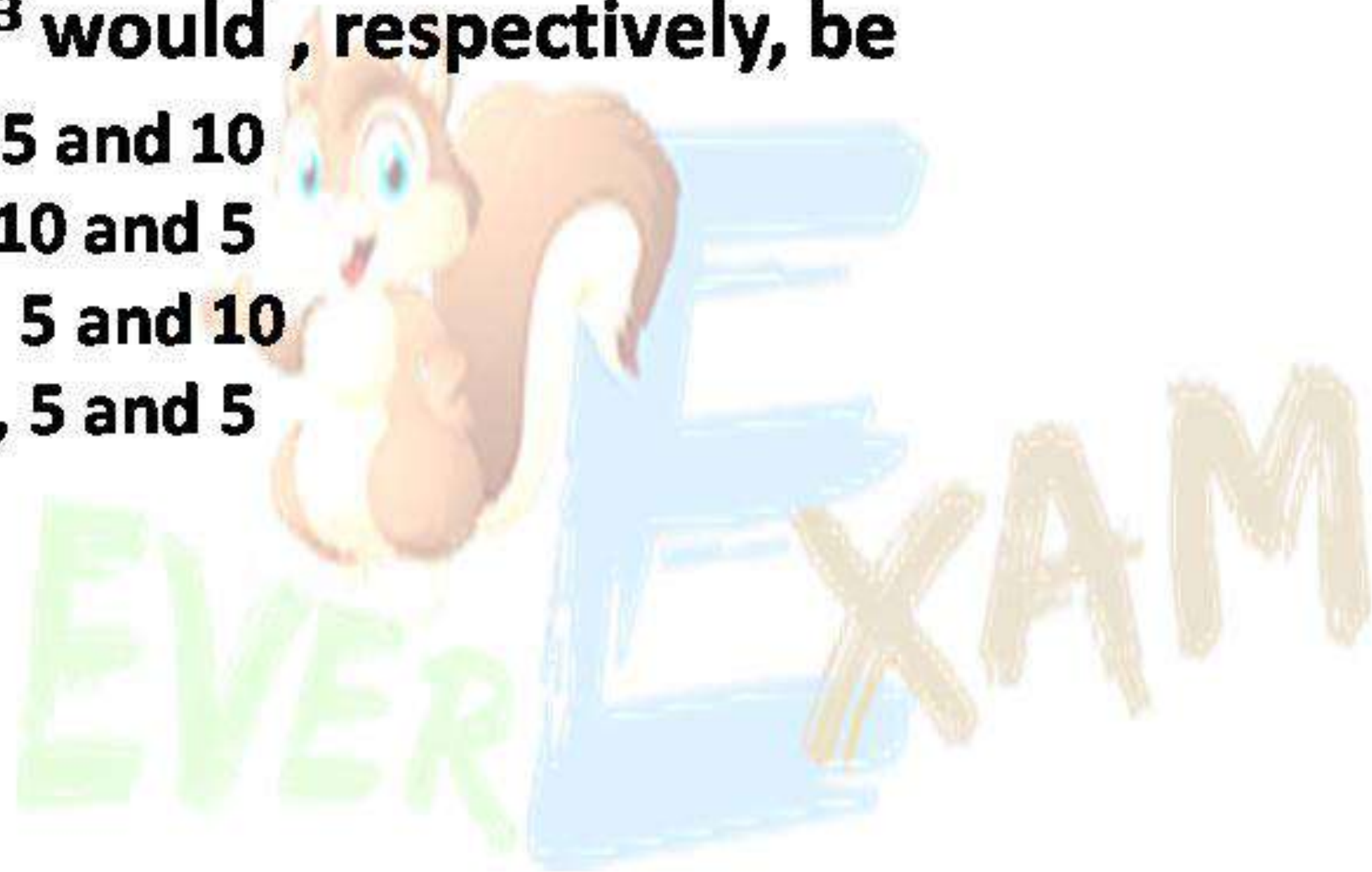
(a)

Z_1

Z

$z\gamma'$

(b)

(c)

$Z_1 \, Y_w$

$Z_1 + z$

$z\gamma_{sat}$ $Z_1\gamma_w$

(d)

Z_1

Z

$z\gamma_{sat}$

13. The total, neutral and effective vertical stresses (in t/m^2) at a depth of 5m below the surface of a fully saturated soil deposit with a saturated density of $2t/m^3$ would , respectively, be

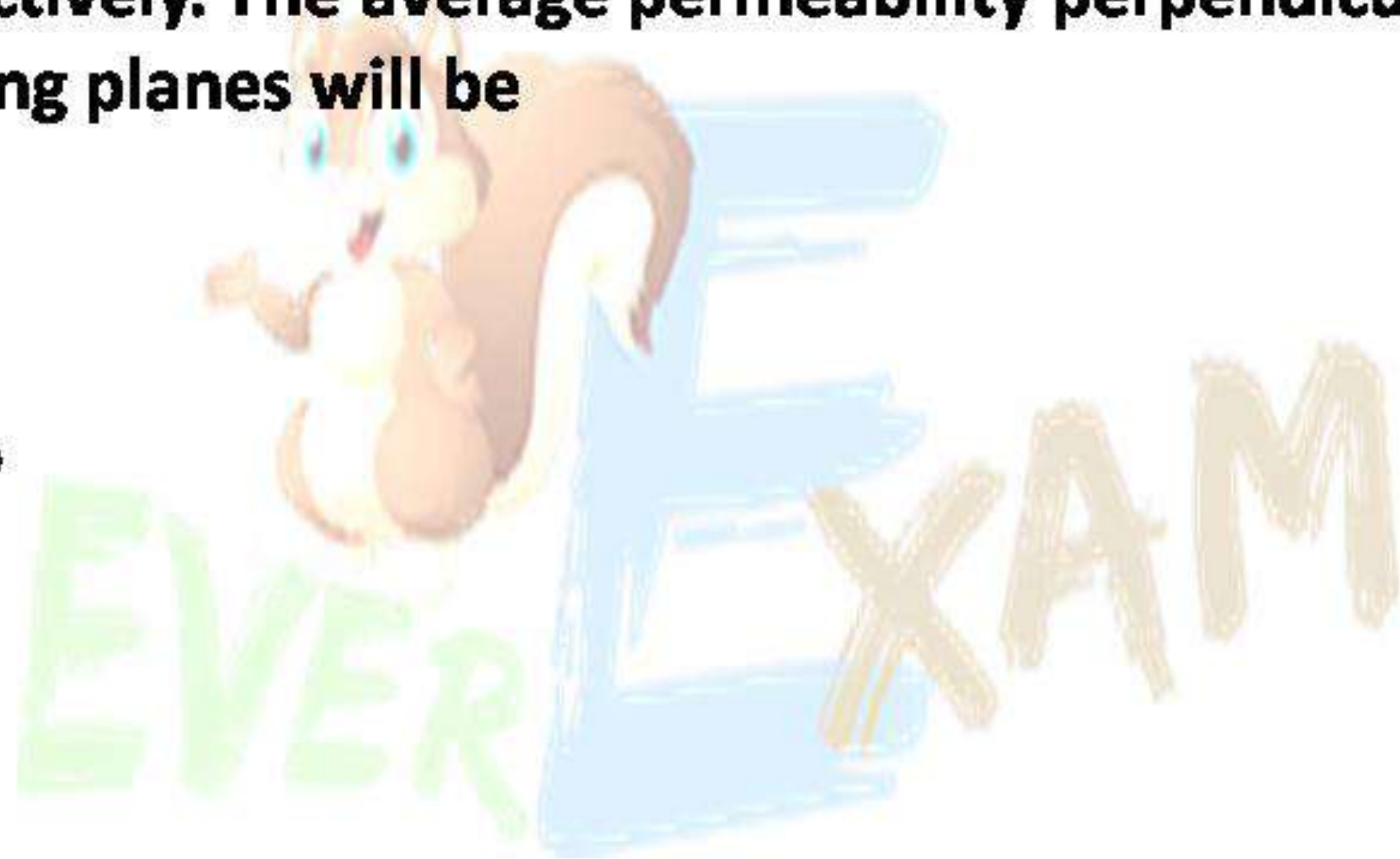(a) 5, 5 and 10

(b) 5, 10 and 5

(c) 10, 5 and 10

(d) 10, 5 and 5

14. **A stratified soil deposit has three layers of thicknesses: $Z_1 = 4$, $Z_2 = 1$, $Z_3 = 2$ units and** **the corresponding permeability of K1 = 2, K2 = 1 and K3 = 4, respectively. The average permeability perpendicular to the bedding planes will be**
a. 4
b. 2
c. 8
d. 16

19. The installation ·of sand drains in clayey soil causes the soil adjacent to the sand drains to undergo which one of the following?

(a) Increase in porosity
(b) Increase in compressibility
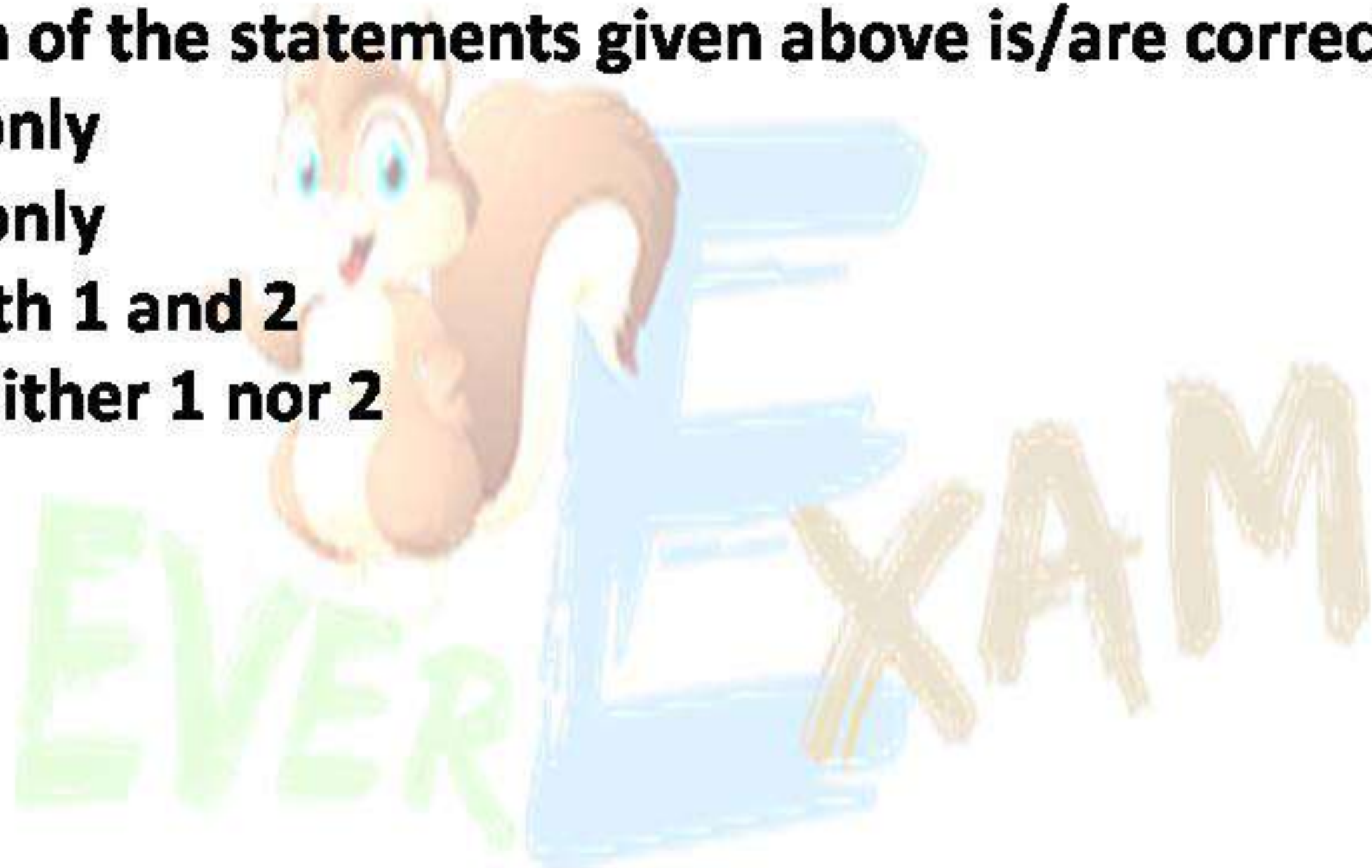(c) Decrease in horizontal permeability
(d) Decrease in shear strength

21. Consider the following statements:

1. Organic matter increases the permeability of a soil
2. Entrapped air decreases the permeability of a soil

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

23. Consider the following statements:

The coefficient of permeability K depends upon

1. Void ratio of the soil.
2. Duration of flow.
3. Equivalent diameter of the soil grains.
4. Shape of the particle.

Which of the above statements are correct?

(a) 1, 2, 3 and 4
(b) 2 and 3 only
(C) 1, 3 and 4 only
(d) 3 and 4 only

24. A soil has discharge velocity of 5×10^{-7} m/s and a void ratio of 0·50. Its seepage velocity will be

(a) 15×10^{-7} m/s
(b) 10×10^{-7} m/s
(c) 20×10^{-7} m/s
(d) 30×10^{-7} m/s

27. Coefficient of permeability of an underground stratum is 0.001 m/s. Discharge obtained from a well of area 20 m^2 dug into this stratum (with drawdown of 2 m) will be
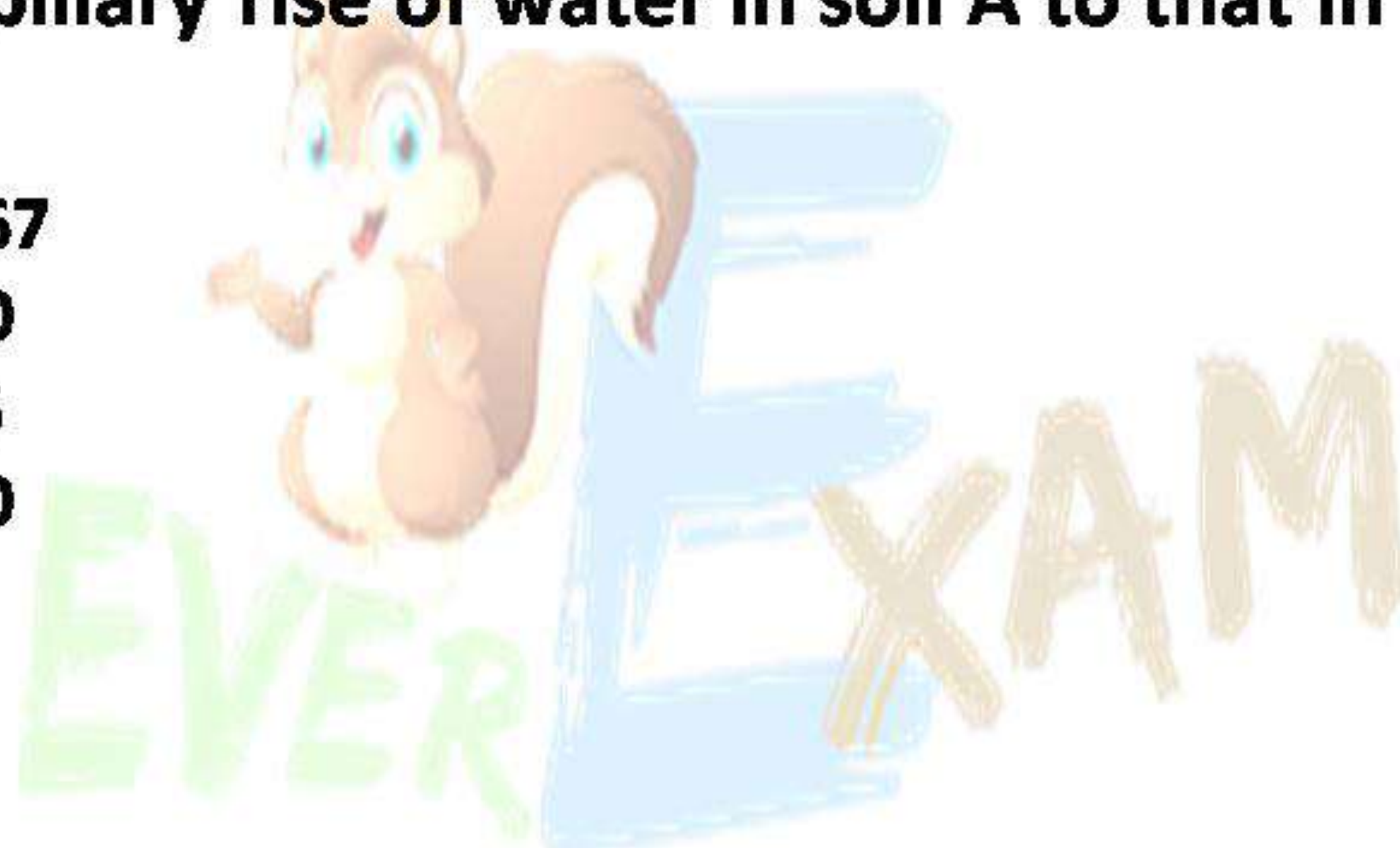
(a) 2400 lpm
(b) 2000 lpm
(c) 1200 lpm
(d) 1000 lpm

31. The void ratio of a given soil A is twice that the another soil B, while the effective size of particles of soil A is one-third of that of .soil B. The ratio of height of capillary rise of water in soil A to that in soil B will be

(a) 0.67
(b) 1.0
(c) 1.5
(d) 2.0

32. A stratum of soil consists of three layers of equal thickness. The permeability of both the top and the bottom layers is 10-4 *cm/s;* and that of the middle layer is 10^{-3} cm/s then the value of the horizontal coefficient of permeability for the entire composite of the soil layers is

(a) 2 x 10-4 cm/s
(b) 3 x 10-4 cm/s
(c) 4 x 10-4 cm/s
(d) 5 x 10-4 cm/s