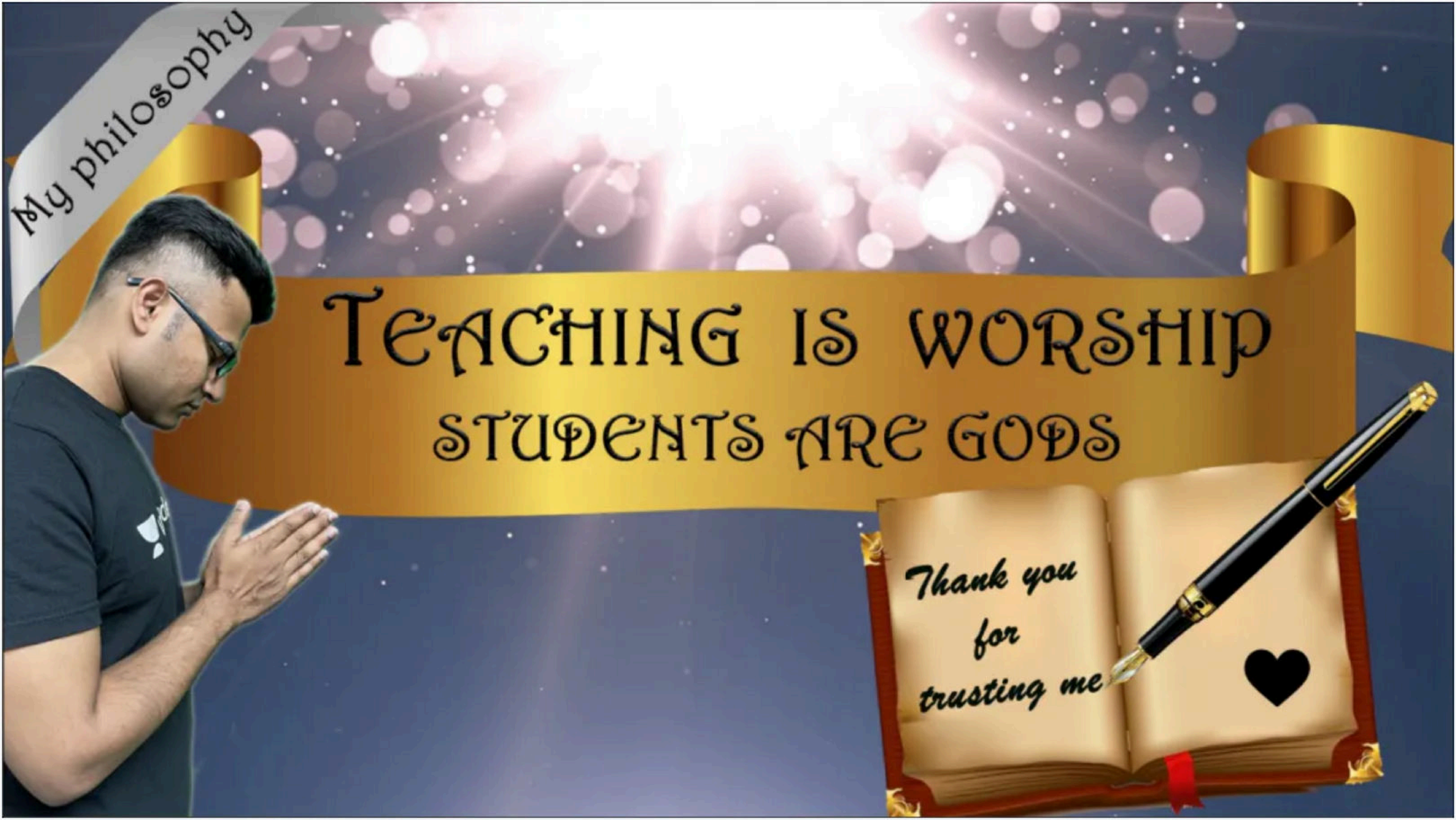
B tree/B+ tree Set-3 Practice Questions | DBMS

Special class

Ravindrababu Ravula • June 24, 2021



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Question 1. Duplicate keys are allowed in

A) B trees

B) B^+ trees

C) Both (a) & (b)

D) None of the above

Question 1. Duplicate keys are allowed in

A) B trees

B) B^+ trees

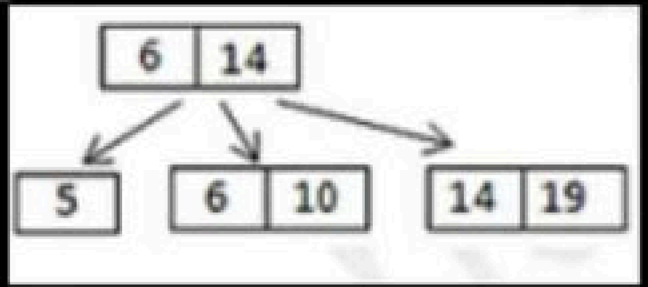
C) Both (a) & (b)

D) None of the above

Answer: (B)

Explanation:

Duplicate keys are allowed in B^+ trees only but not in B trees.
In B^+ tree, the parent key and the first key in its right child are always same.



Here 16 and 14 are duplicate keys.
So, answer is (b).

Question 2. Consider a B^+ tree in which the maximum number of keys in an internal node is 5. What is the minimum number of keys in root-node?

A) 1

B) 2

C) 3

D) 4

Question 2. Consider a B^+ tree in which the maximum number of keys in an internal node is 5. What is the minimum number of keys in root-node?

A) 1

B) 2

C) 3

D) 4

Answer: (A)

Explanation:

Irrespective of order of given B^+ tree, we can say that minimum number of keys in root-node is 1.
So, answer is (a).

Question 3. Which of the following is the key factor for preferring B^+ tree to binary search trees for indexing database relations?

A) Database relations have a large number of records

B) Database relations are stored on primary key

C) B^+ trees requires less memory than binary search tree

D) Data transfer from Disks is in block

Question 3. Which of the following is the key factor for preferring B^+ tree to binary search trees for indexing database relations?

A) Database relations have a large number of records

B) Database relations are stored on primary key

C) B^+ trees requires less memory than binary search tree

D) Data transfer from Disks is in block

Answer: (D)

Explanation:

In order to search for a key, in BST on an average we have to search the nodes equal to the height of tree. The height of BST is large since each node has only 2 children unlike B^+ tree which has more children and so height of B^+ tree is small compared to B tree and no. of nodes to access is small compared to BST tree to search an element. We know that in B^+ tree each node is accommodated in to one disc block. In BST also it may be possible that each node is in one disc block. As number of nodes to access in BST is more compared to B tree or B^+ tree to search for an element , disk block accesses in BST are more compared to B or B^+ tree as a result searching takes less time in B or B^+ tree rather than B tree.

Question 4. Let the order of B tree is 32 and the B tree is 63 percent full. What will be the average number of <key, data-pointer> entries that a 2-level B tree holds?

A) 7999

B) 7600

C) 380

D) 7980

Question 4. Let the order of B tree is 32 and the B tree is 63 percent full. What will be the average number of <key, data-pointer> entries that a 2-level B tree holds?

A) 7999

B) 7600

C) 380

D) 7980

Answer: (A)

Explanation:

Given order of B tree is 32 and it is 63 percent full.
∴On an average, 32×0.63 block pointers present in each node =20.16⟹approximately 20 block pointers.
Root – 1 node – 19 (<key, data-pointer> entries) 20 block pointers
Level 1 – 20 nodes – 20 * 19 = 380 entries 20 * 20 = 400 block pointers
Level 2 – 400 nodes – 400 * 19=7600 entries 400 * 20 = 8000 block pointers
∴ 2-level B tree holds (19+380+7600)entries =7999 entries on an average.
So, answer is (a).

Question 5. Consider a B tree of order 3. If we insert the keys in order (1,2,3,4,5,6,7) to an empty tree, how many splitting of nodes should be done?

A) 1

B) 2

C) 3

D) 4

Question 5. Consider a B tree of order 3. If we insert the keys in order (1,2,3,4,5,6,7) to an empty tree, how many splitting of nodes should be done?

A) 1

B) 2

C) 3

D) 4

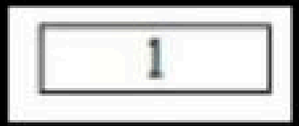
Answer: (D)

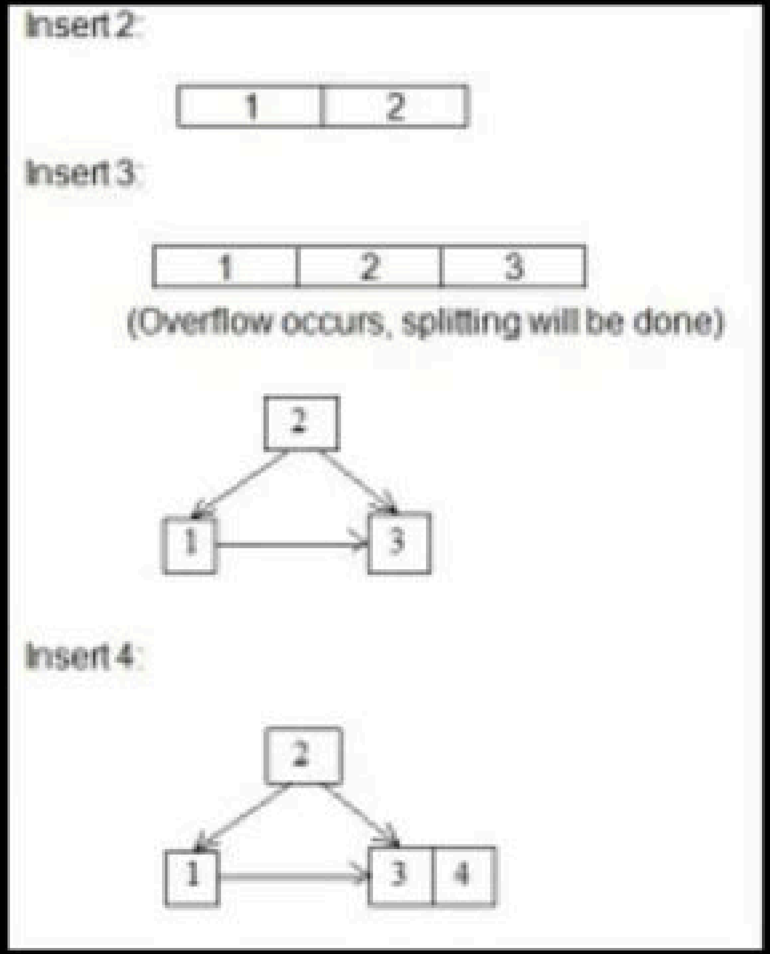
Explanation:

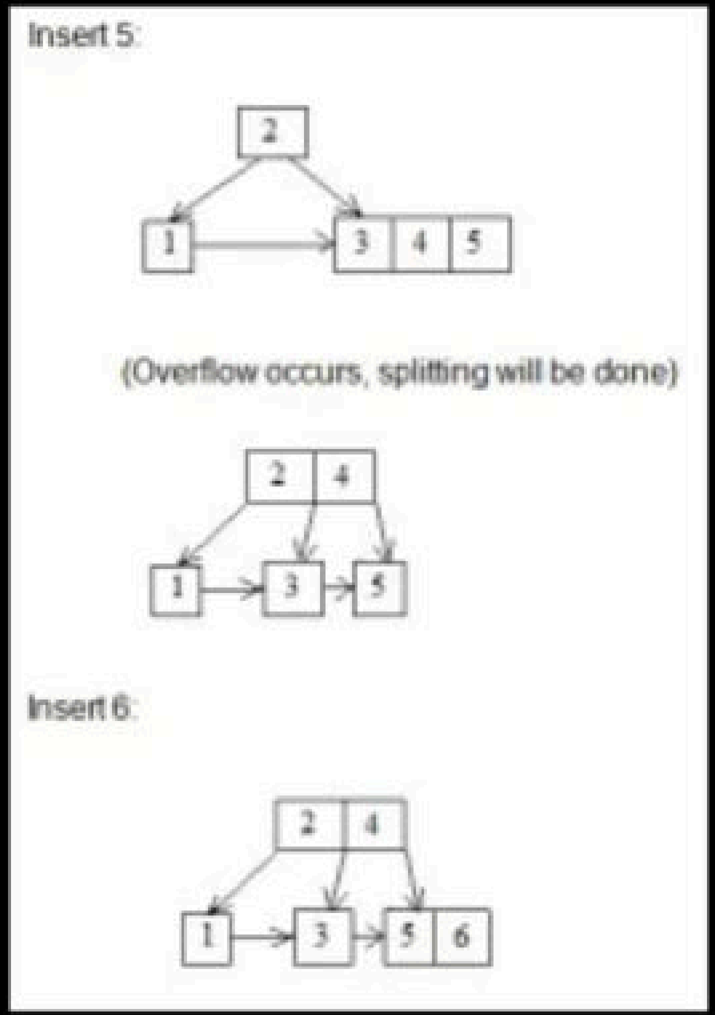
Given B tree of order p = 3

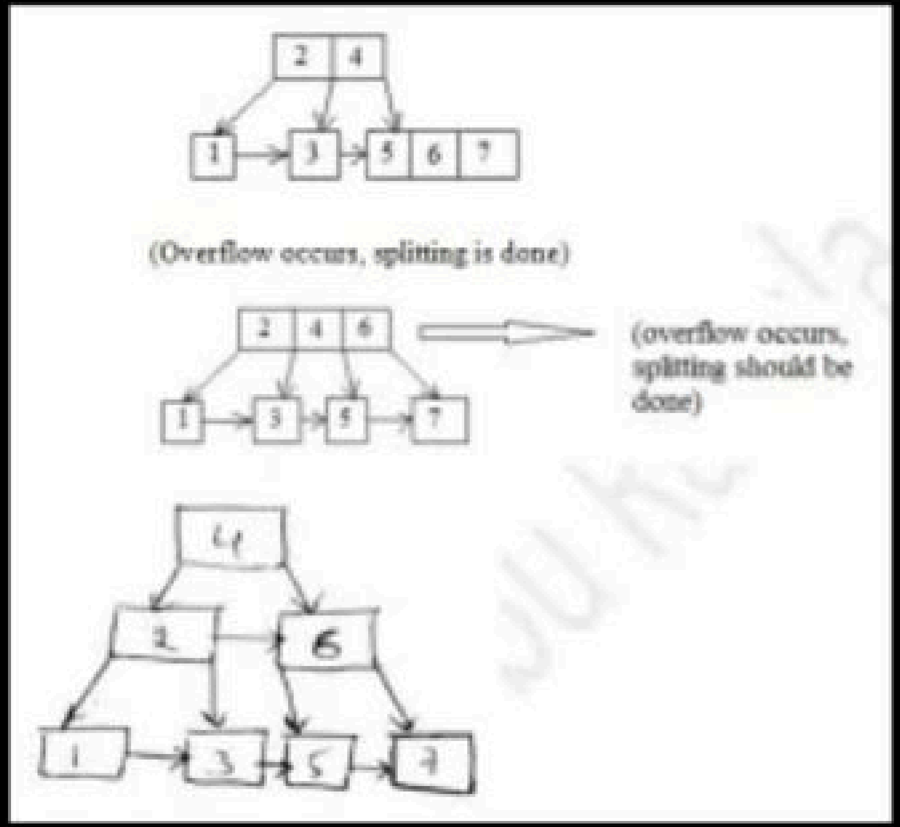
	Min no of keys	Max no of keys
Root	1	2
Non-leaf	1	2
Leaf	1	2

Insert 1:









Insert 7:

∴ Number of splitting done = 4

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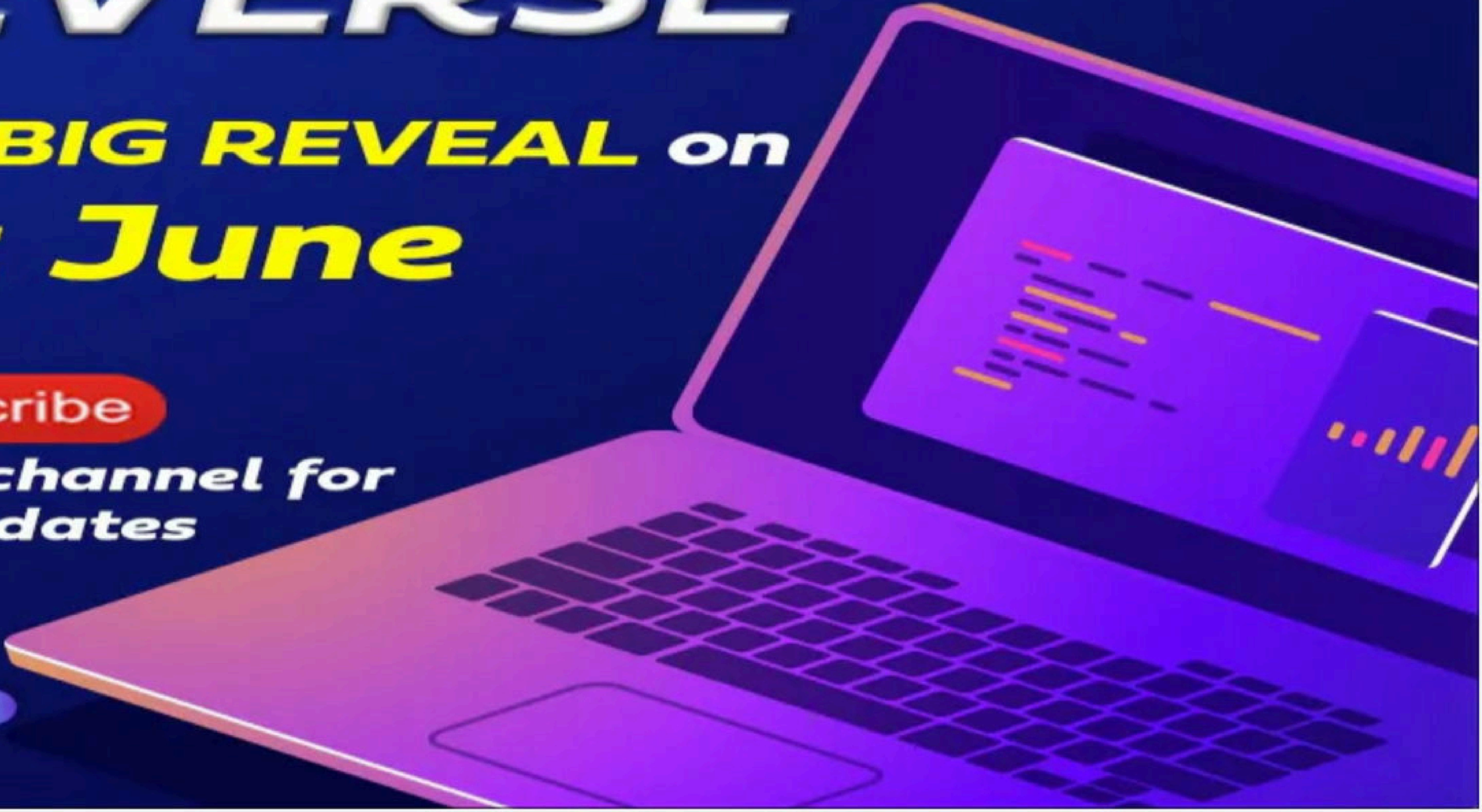

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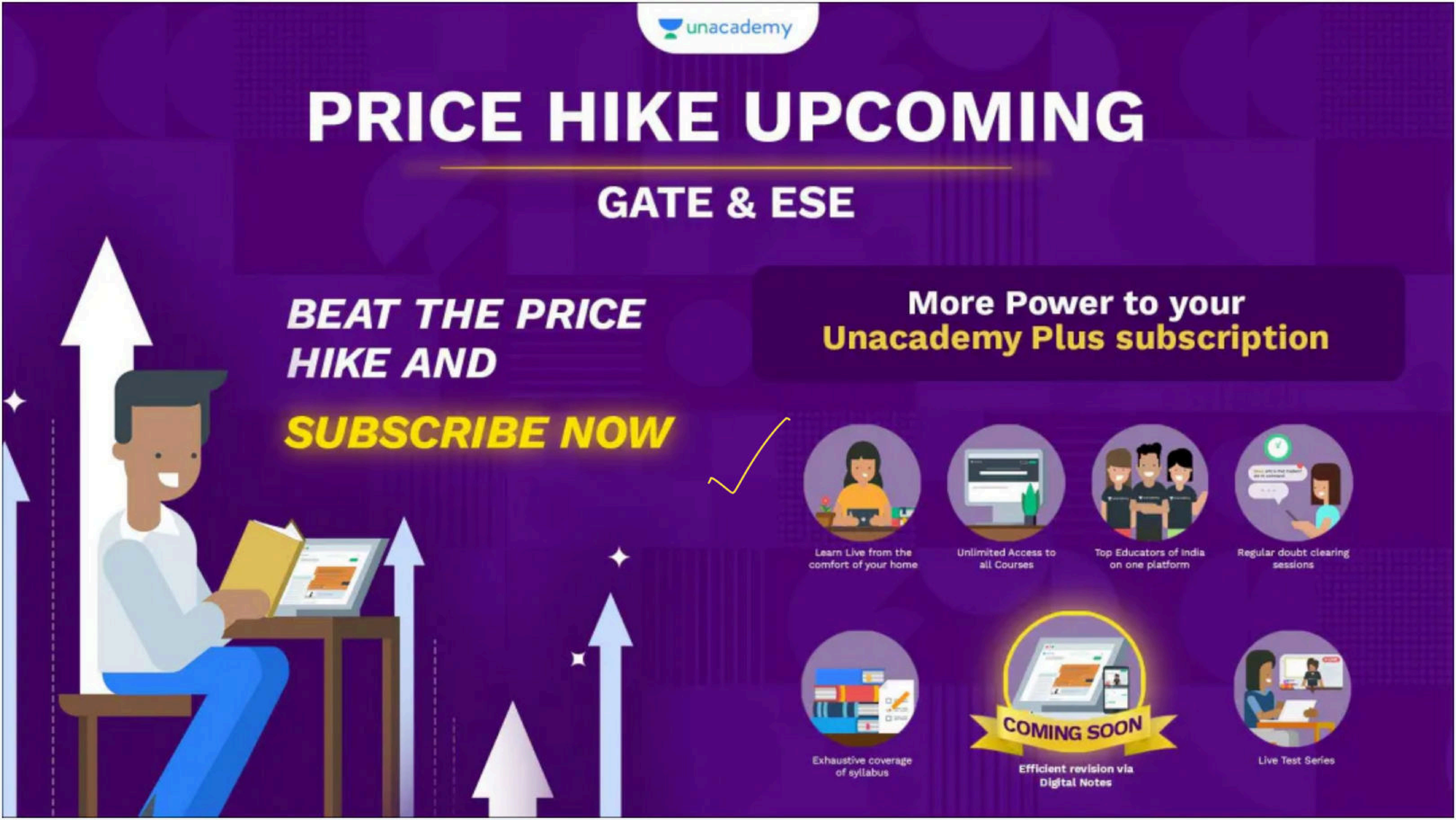
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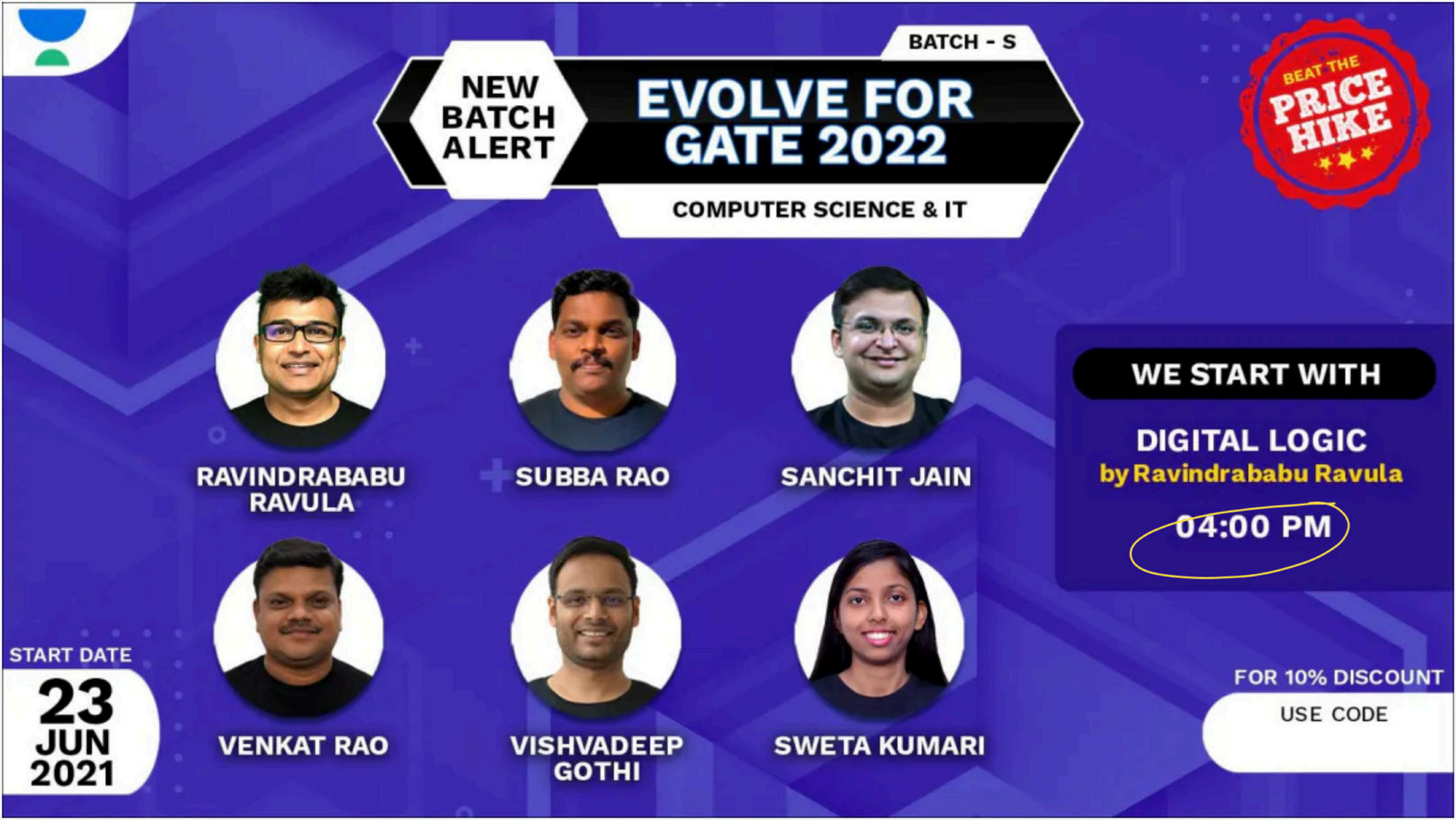
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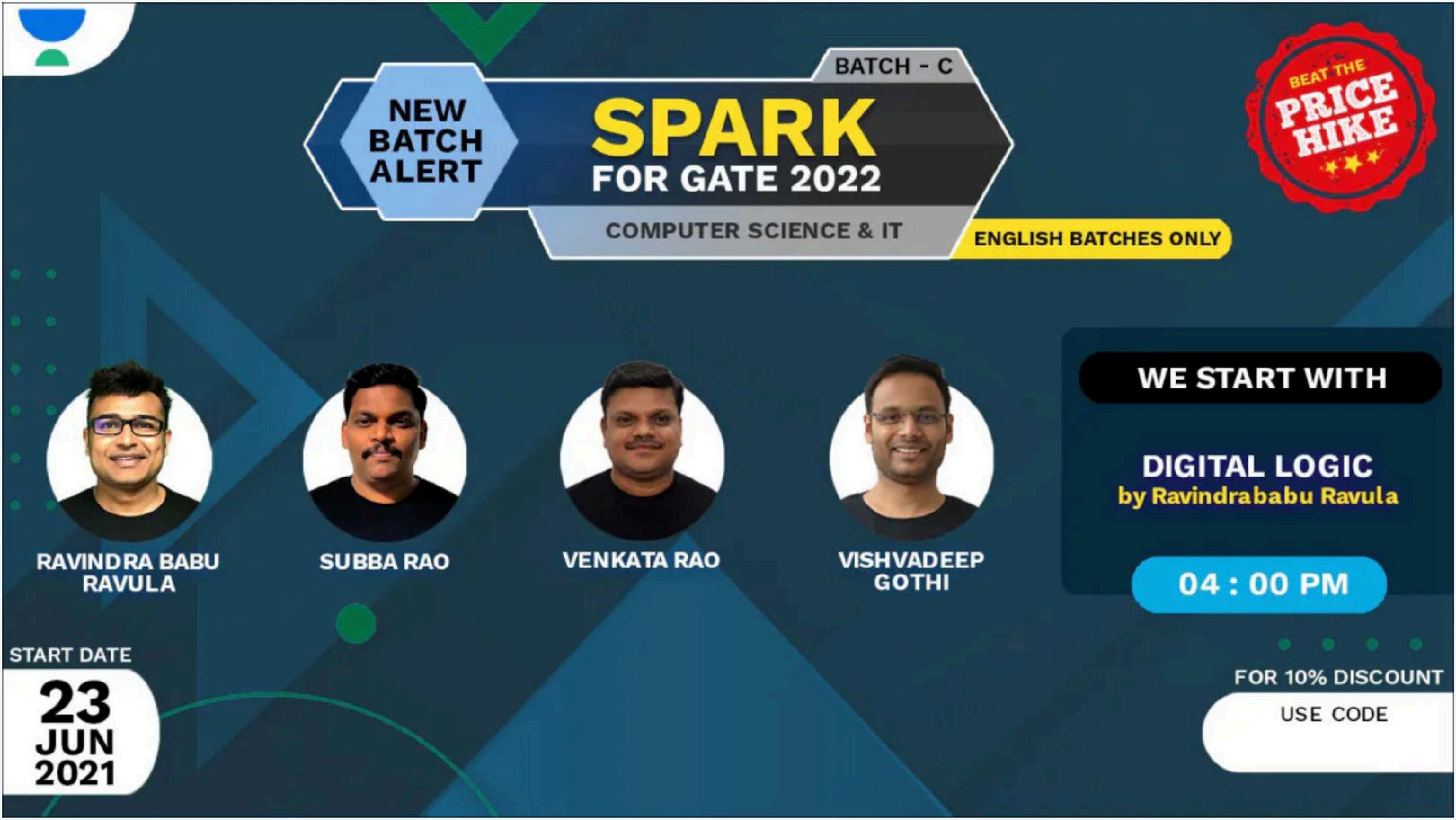

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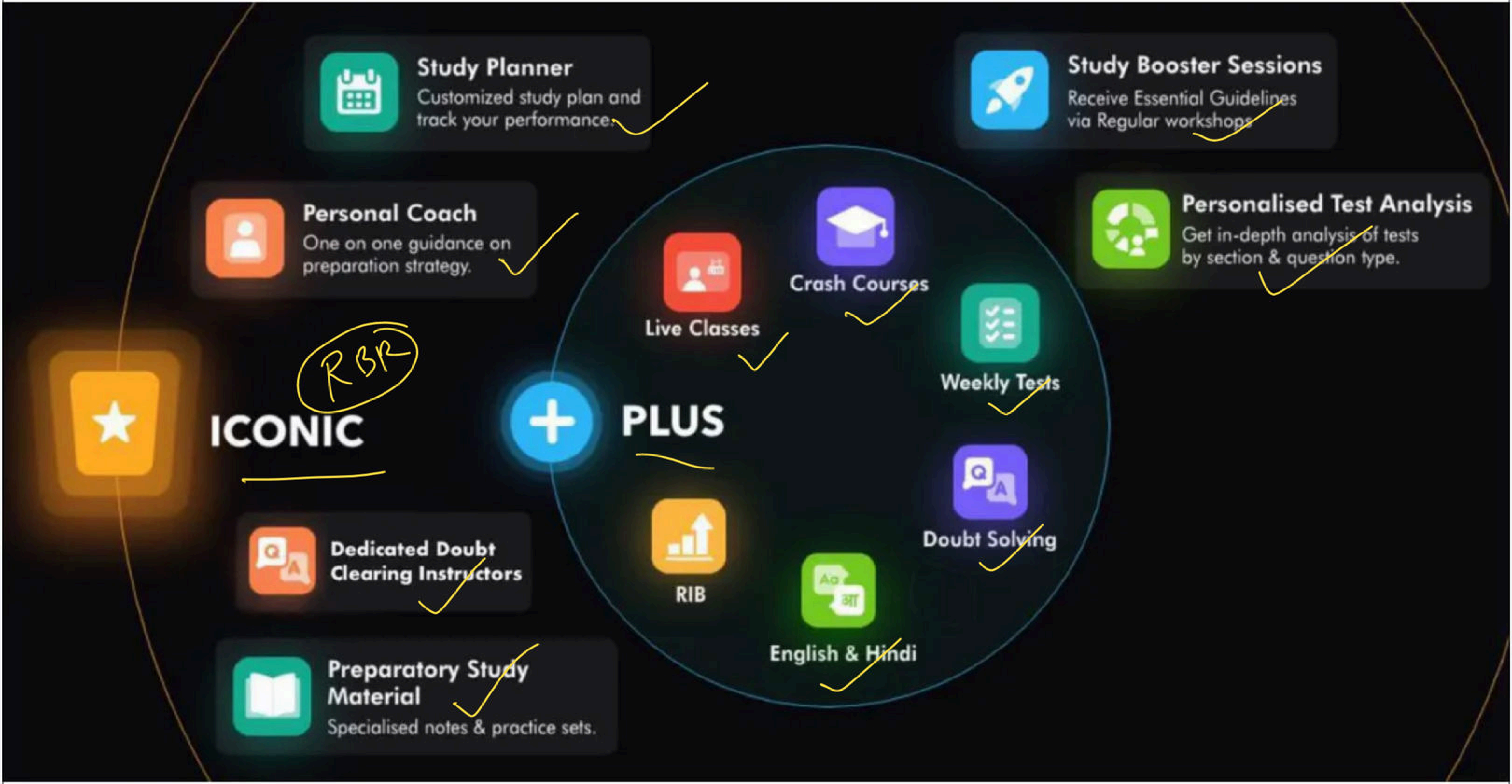

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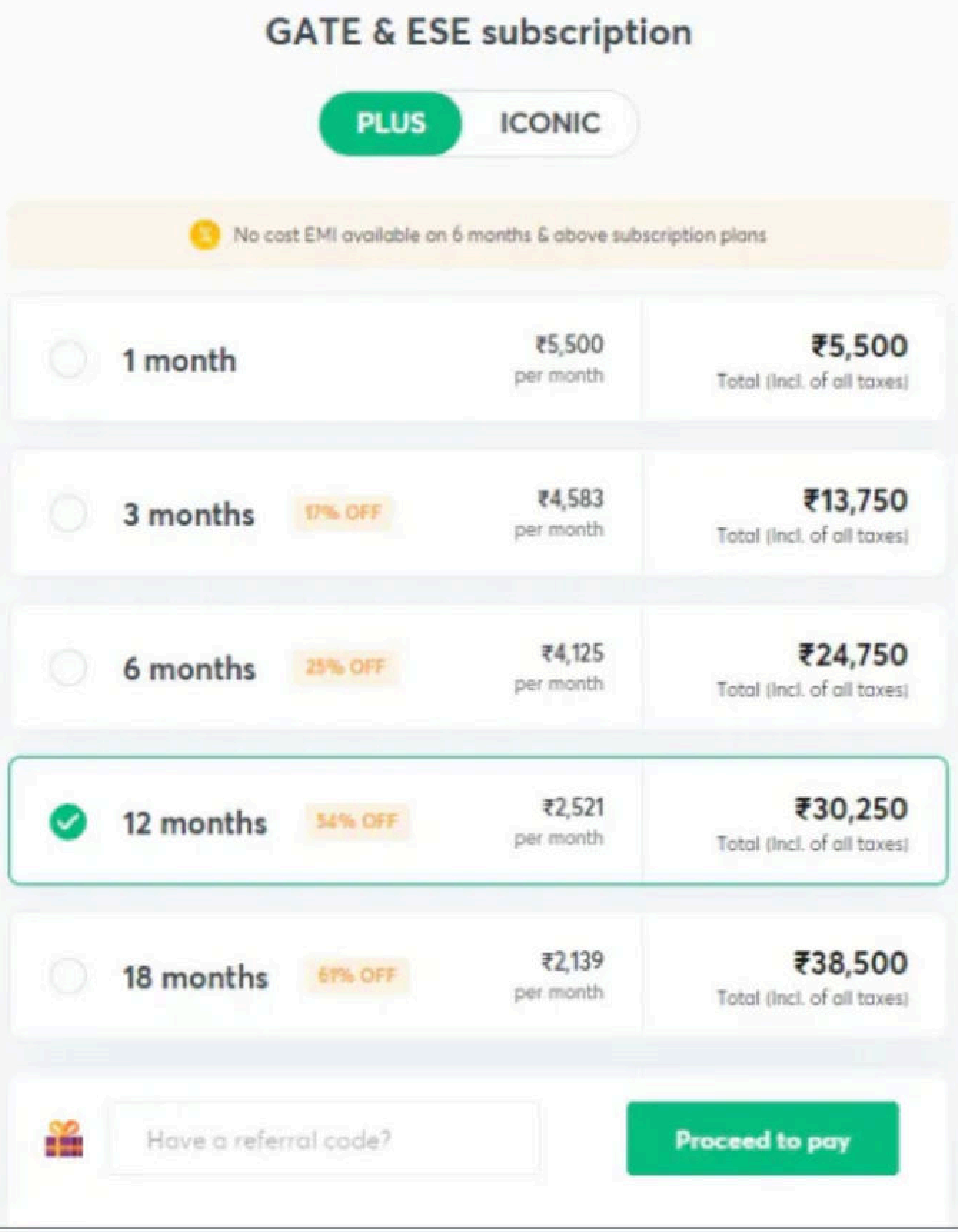
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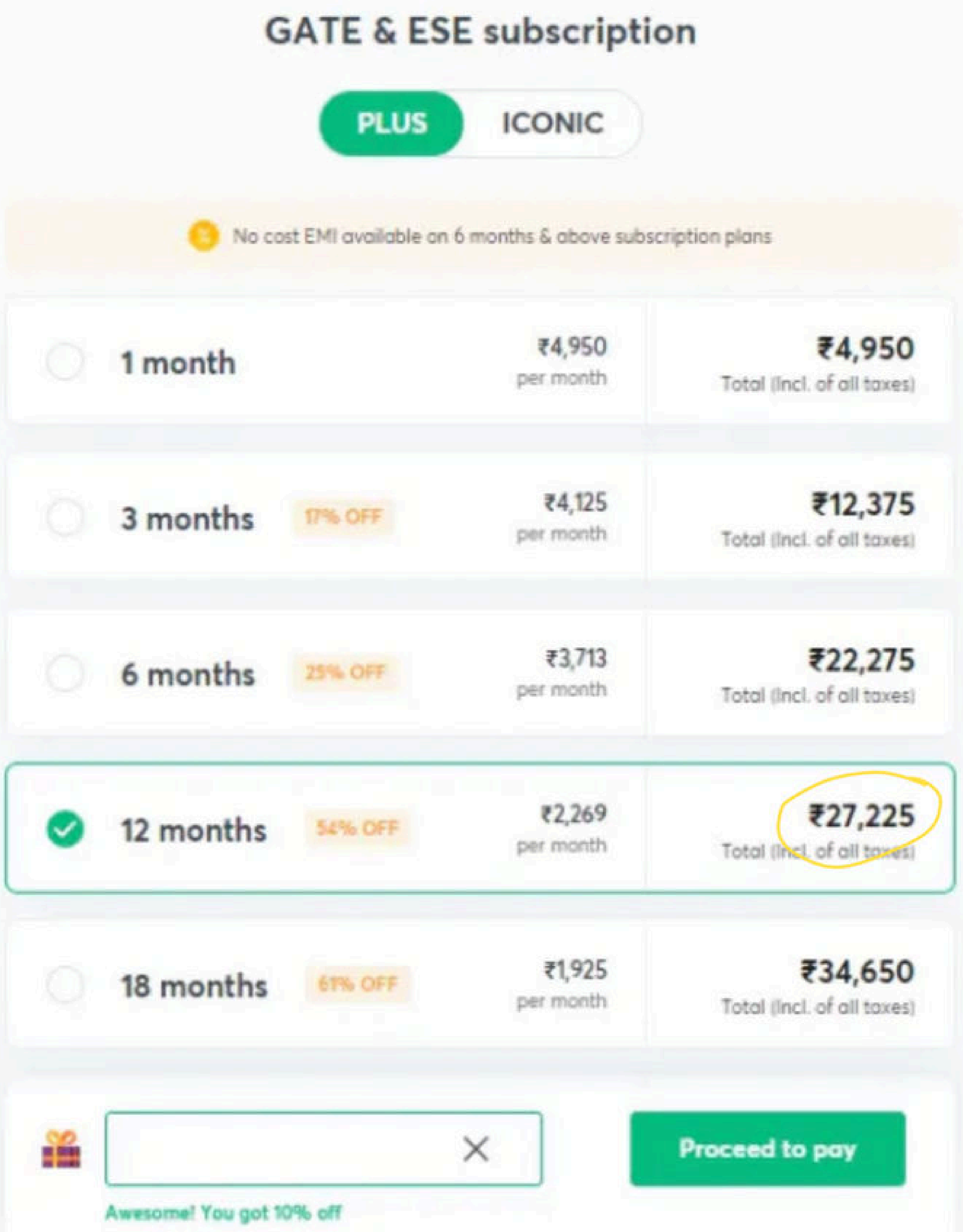
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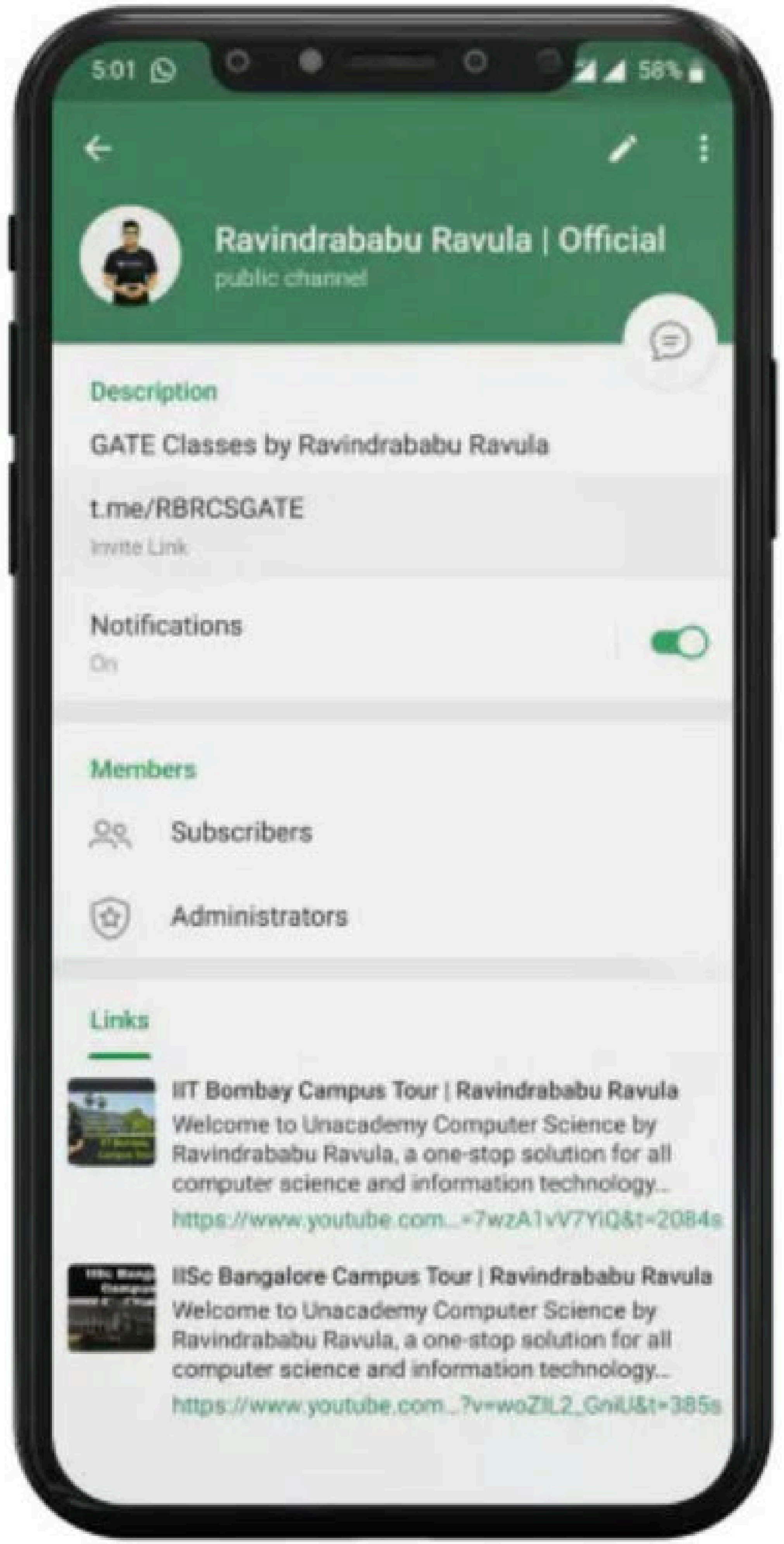


Question 6. In a database file structure, the search key value field is 6 bytes long, the block size is 1024 bytes, a record pointer is 10 bytes and a block pointer is 5 bytes long.
The largest possible order of a non-leaf node in a B^+ tree is used in implementing this file structure is

A) 91

B) 92

C) 93

D) 94

Question 6. In a database file structure, the search key value field is 6 bytes long, the block size is 1024 bytes, a record pointer is 10 bytes and a block pointer is 5 bytes long.
The largest possible order of a non-leaf node in a B^+ tree is used in implementing this file structure is

A) 91

B) 92

C) 93

D) 94

Answer:(C)

Explanation:

Let n be the order of non-leaf node in B^+ tree.
Given block size = 1024 bytes
We know that structure of non-leaf node in B^+ tree is

P_1	k_1	P_2	k_2	....	k_{n-1}	P_n

P_1→block pointer
k_1→search key field
We have to accommodate the whole non-leaf node into one block.
∴Let P_b be block pointer size, here P_b=5 bytes
k be size of search key field, here k=6 bytes
$\therefore (n)(P_b)+(n-1)(k)\leq 1024$
$\Rightarrow (n)(5)+(n-1)(6)\leq 1024$
$\Rightarrow 5n+6n-6\leq 1024$
$\Rightarrow 11n-6\leq 1024$
$\Rightarrow 11n\leq 1030$
$\Rightarrow n\leq 1030/11$
$\Rightarrow n\leq 93.6363...$
Largest possible of n is floor(93.6363) i.e n is 93.
∴ Order of non-leaf node in B^+ tree is 93.
So, answer is (c).

Question 7. In a database file structure, the search key value field is 6 bytes long, the block size is 1024 bytes, a record pointer is 10 bytes and a block pointer is 5 bytes long.

The largest possible order of a B tree, if it is used in implementing this file structure is

A) 50

B) 51

C) 48

D) 49

Question 7. In a database file structure, the search key value field is 6 bytes long, the block size is 1024 bytes, a record pointer is 10 bytes and a block pointer is 5 bytes long.

The largest possible order of a B tree, if it is used in implementing this file structure is

A) 50

B) 51

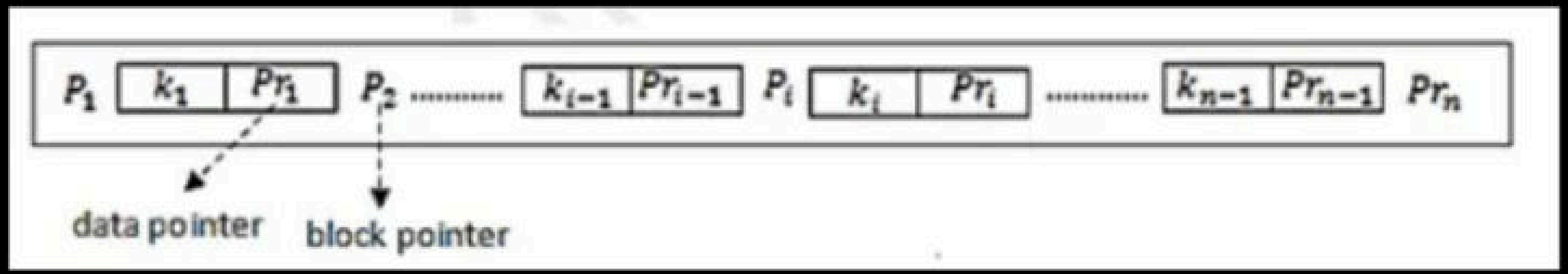
C) 48

D) 49

Answer: (D)

Explanation:

Let n be the order of B tree.
Given block size = 1024 bytes
We know that structure of non-leaf node in B tree is



In case of leaf node block pointers will be NULL values.
We have to accommodate the whole node into one disc block.
Let P_b be block pointer size $\Longrightarrow P_b$=5 bytes
Let k be the size of search key field $\Longrightarrow k$=6 bytes
Let P_r be the size of record pointer $\Longrightarrow P_r$=10 bytes
$\therefore n(P_b)+(n-1)(k+P_r)\leq 1024$
$\Longrightarrow (n)(5)+(n-1)(6+10)\leq 1024$
$\Longrightarrow 5n+16n-16\leq 1024$
$\Longrightarrow 21n-16\leq 1024$
$\Longrightarrow 21n\leq 1024$
$\Longrightarrow n\leq 49.5238...$
$\Longrightarrow$ Largest possible value of n is floor(49.5238....) i.e n is 49 floor
$\therefore$ Order of B tree is 49.
Answer is (d).

Question 8. Given the order of B tree as 4, the maximum and minimum number of keys present in root, internal & leaf node respectively?

A) (3, 1) (3, 1) (4, 1)

B) (3, 1) (3, 1) (3, 1)

C) (4, 2) (4, 2) (4, 2)

D) (3, 2) (3, 2) (3, 2)

Question 8. Given the order of B tree as 4, the maximum and minimum number of keys present in root, internal & leaf node respectively?

A) (3, 1) (3, 1) (4, 1)

B) (3, 1) (3, 1) (3, 1)

C) (4, 2) (4, 2) (4, 2)

D) (3, 2) (3, 2) (3, 2)

Answer: (B)

Explanation:

Given order of B tree = 4 (p)
Maximum number of keys present in root/leaf/non-leaf node is (p-1) = 3
Minimum number of keys present in root node is 1 and in non-leaf/leaf node is ceil(p/2) -1
= ceil(2)-1
= (2-1)
= 1

	Max no of keys	Min no of keys
Root	3	1
Non-leaf	3	1
Leaf	3	1

Question 9. In a database file structure, the search key field is 12 bytes long, the block size is 512 bytes, a record pointer is 7 bytes long and block pointer is 6 bytes. The largest possible order of a leaf node in a B^+ tree implementing this file structure is?

A) 26

B) 27

C) 25

D) 24

Question 9. In a database file structure, the search key field is 12 bytes long, the block size is 512 bytes, a record pointer is 7 bytes long and block pointer is 6 bytes. The largest possible order of a leaf node in a B^+ tree implementing this file structure is?

A) 26

B) 27

C) 25

D) 24

Answer: (A)

Explanation:

Let order of a leaf node be p_{leaf}
Node should be accommodated in a block
Given block pointer size = 6 bytes
Record pointer size = 7 bytes
Search key field size = 12 bytes

$\therefore (p_{leaf})(7 + 12) + 6 \le 512$
$19\, p_{leaf} \le 506$
$p_{leaf} \le 506/19$
$p_{leaf} \le \underbrace{26.6315}$

$\therefore$ Order of leaf node in B^+ tree is 26.

Question 10. Consider the following statements:
A: The number of keys that can be stored in a node of B-tree is less compared to B+ tree.
R: B-tree node stores keys and record pointer associated with it where as in B+ tree node stores only key.

A) A is true but R is wrong

B) A is wrong but R is true

C) A is true and R is correct reason for A

D) A is true and R is not correct reason for A

Question 10. Consider the following statements:
A: The number of keys that can be stored in a node of B-tree is less compared to B+ tree.
R: B-tree node stores keys and record pointer associated with it where as in B+ tree node stores only key.

A) A is true but R is wrong

B) A is wrong but R is true

C) A is true and R is correct reason for A

D) A is true and R is not correct reason for A

Answer: (C)

Explanation:

The given statement "A" is true and "R" is correct reason for it.