Kunal Jha
Course: GATE
Computer Science Engineering(CS)

HOME
MY TEST
BOOKMARKS
MY PROFILE
REPORTS
BUY PACKAGE
NEWS
TEST SCHEDULE

ENGINEERING MATHEMATICS + GENERAL APTITUDE (GATE - 2021) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(0) | INCORRECT(0) | SKIPPED(33)

Q. 1 Solution Video | Have any Doubt ?

The lecture was not very interesting. In fact I _____ in the middle of it.

A showed off

B put off

C dozed off — Correct Option

Solution :
(c)

D plugged off

QUESTION ANALYTICS +

Q. 2 Solution Video | Have any Doubt ?

Number of different prime factors of $(30)^7 \times (22)^5 \times (34)^{11}$.

A 4

B 3

C 5 — Correct Option

Solution :
(c)

$$(30)^7 \times (22)^5 \times (34)^{11} = 2^7 \times 3^7 \times 5^7 \times 2^5 \times 11^5 \times 2^{11} \times 17^{11}$$
$$= 2^{23} \times 3^7 \times 5^7 \times 11^5 \times 17^{11}$$

Hence 5 different prime factor.

D 7

QUESTION ANALYTICS +

Q. 3 Solution Video | Have any Doubt ?

If Rs 636 is divided between A, B, C such that A gets 20% more than B, and B gets 25% less than C, then the share of C is

A Rs 280

B Rs 240 — Correct Option

Solution :
(b)

Let share of B is x,

$\therefore$ Share of A is $= 1.2\,x$

and share of C is $= \frac{x}{0.75} = 1.33x$

$$x + 1.2x + 1.33x = 636$$
$$x = 180$$

Hence share of C is 240

C Rs 220

D Rs 200

QUESTION ANALYTICS +

Q. 4 FAQ | Solution Video | Have any Doubt ?

Consider the following function:
$f(x) = x^3$ if $x \neq 2$
$= 8$ if $x = 2$
Which of the following is correct?

A f is not defined properly

B f is continuous at $x = 2$ — Correct Option

Solution :
(b)

- f is defined properly
- $$f(x) = x^3 \text{ if } x \leq 2$$
  $$= 8 \text{ if } x = 2$$
  $$\lim_{x \to 2^+} f(x) = \lim_{x \to 2^-} f(x) = \lim_{x \to 2} f(x)$$

Hence $f(x)$ is continuous at $x = 2$.

C f is discontinuous at $x = 2$

D None of these

QUESTION ANALYTICS +

Q. 5 Solution Video | Have any Doubt ?

A fair dice is rolled. Let A denote the event of obtaining a number less than or equal to 5 and B denote the event of obtaining an odd number. Then which of the following is true?

A $P\left(\frac{A}{B}\right) = 0$

B $P\left(\frac{B}{A}\right) = 1$

C $P\left(\frac{B}{A}\right) = 0$

D $P\left(\frac{A}{B}\right) = 1$ — Correct Option

Solution :
(d)

$$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$
$$P(A \cap B) = \{1, 3, 5\}$$
$$P(A \cap B) = \frac{3}{6} = \frac{1}{2}$$
$$P(B) = \frac{3}{6} = \frac{1}{2}$$
$$P\left(\frac{A}{B}\right) = \frac{\frac{1}{2}}{\frac{1}{2}} = 1$$

QUESTION ANALYTICS +

Q. 6 Have any Doubt ?

If $x^2 - 10x + 16 < 0$. Which of the following can be the value of $P = x^2 + 10x + 16$?

A $P < 40$

B $0 < P < 40$

C $P > 60$

D $40 < P < 160$ — Correct Option

Solution :
(d)

$$x^2 - 10x + 16 < 0$$
$$(x - 2)(x - 8) < 0$$

Either $(x - 2) > 0$ and $(x - 8) < 0$ or $(x - 2) < 0$ and $(x - 8) > 0$

- $x > 2$ and $x < 8$ or $x < 2$ and $x > 8 \cdot 8 < x < 2$ not possible.
  Thus gives the minimum value of $x > 2$ and maximum value of $x < 8$.
- To get the value of $P = x^2 + 10x + 16$

$P = (x + 2)(x + 8)$

- To get the value of P, put $x = 2$ which gives $P_{min} = 4 \times 10 = 40$.
- To get maximum value of P, put $x = 8$ which gives $P_{max} = 10 \times 16 = 160$. Leading us to conclude that $40 < P < 160$.

QUESTION ANALYTICS +

Q. 7 Solution Video | Have any Doubt ?

The greatest number which can divide 1356, 1868 and 2764 leaving the same remainder 12 in each case is

A 64 — Correct Option

Solution :
(a)

Required number = H.C.F of (1356 – 12), (1868 – 12) and (2764 – 12)
= H.C.F of 1344, 1856 and 2752 = 64

B 124

C 156

D 260

QUESTION ANALYTICS +

Q. 8 Solution Video | Have any Doubt ?

What value of 'x' makes the given matrix not invertible?

$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 5 & x & 6 \end{bmatrix}$$

A 0

B $\frac{11}{2}$ — Correct Option

Solution :
(b)

The determinant of this matrix is

$1(6 - 2x) - 1(0 - 10) + 1(0 - 5) = 11 - 2x$

A matrix is not invertible if and only if it's determinant equals zero i.e.

$$11 - 2x = 0$$

$$x = \frac{11}{2}$$

So, this matrix is not invertible if and only if $x = \frac{11}{2}$.

C 7

D 4

QUESTION ANALYTICS +

Q. 9 Solution Video | Have any Doubt ?

If the price of sugar rises from Rs 6/kg to Rs 7.50/kg. A person to have no increase in his expenditure on sugar will have to reduce his consumption of sugar by _____ %.

20 — Correct Option

Solution :
20

Let, original consumption = 100 kg
New consumption = x kg
So, $100 \times 6 = x \times 7.5$
$x = 80$ kg
$\therefore$ Reduction in consumption = 20%.

QUESTION ANALYTICS +

Q. 10

Solution Video | Have any Doubt ?

The value of $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dy\,dx\,dz$ is

0 — Correct Option

Solution :
0

$$I = \int_{-1}^{1}\int_{0}^{z}\left|xy+\frac{y^2}{2}+yz\right|_{x-z}^{x+z}dx\,dz$$

$$= \int_{-1}^{1}\int_{0}^{z}\left[(x+z)(2z)+\frac{1}{2}(4xz)\right]dx\,dz$$

$$= 2\int_{-1}^{1}\left|\frac{x^2z}{2}+z^2x+\frac{x^2z}{2}\right|_{0}^{z}dz$$

$$= 2\int_{-1}^{1}\left(\frac{z^3}{2}+z^3+\frac{z^3}{2}\right)dz$$

$$= 4\left|\frac{z^4}{4}\right|_{-1}^{1} = 0$$

QUESTION ANALYTICS +

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Q. 11 FAQ | Solution Video | Have any Doubt ?

Complete the series 343, 1331, 2197, 4913, _____ .

6859 — Correct Option

Solution :
6859

7^3 , 11^3, 13^3, 17^3, 19^3

$\because$ 7, 11, 13 and 17 are all prime numbers.

The series is cube of these number.

QUESTION ANALYTICS +

Q. 12 Solution Video | Have any Doubt ?

A facebook password must contains three characters, the password has to contain one upper case and one lower case from the English alphabet and one numeral from 1 to 9. How many distinct passwords are possible?

36504 — Correct Option

Solution :
36504

Total number of ways will be $9 \times 26 \times 26 \times 3!$

$= 36504$

QUESTION ANALYTICS +

Q. 13 Solution Video | Have any Doubt ?

If A, B, C are mutually exclusive and exhaustive events associated with a random experiment and $P(B) = 0.6\ P(A)$ and $P(C) = 0.2\ P(A)$, then $P(A)$ is _____.
(Upto 2 decimal places)

0.55 [0.55 - 0.60] — Correct Option

Solution :
0.55 [0.55 - 0.60]

Since, A, B, C are mutually exclusive and exhaustive events, we have

$$P(A) + P(B) + P(C) = 1$$
$$P(A) + 0.6\ P(A) + 0.2\ P(A) = 1$$
$$1.8\ P(A) = 1$$
$$P(A) = \frac{1}{1.8} = \frac{10}{18} = \frac{5}{9} = 0.55$$

QUESTION ANALYTICS +

Q. 14 Solution Video | Have any Doubt ?

The trace and determinant of a 2 × 2 matrix are known to be −2 and −35 respectively. Which of the following are correct?

A. −30 and −5 are eigen values

B. −7 is one of the eigen values — Correct Option

C. 5 is one of the eigen values — Correct Option

D. −37 is one of the eigen values

YOUR ANSWER - NA | CORRECT ANSWER - b,c | STATUS - SKIPPED

Solution :
(b, c)

$$\Sigma\lambda_i = \text{Trace (A)} = -2$$
$$\lambda_1 + \lambda_2 = -2 \qquad \text{(i)}$$

$$\Pi\lambda_i = |A| = -35$$

$$\lambda_1\lambda_2 = -35 \quad \ldots(ii)$$

Solving (i) and (ii), we get

$$\lambda_1 = 5$$

and $$\lambda_2 = -7$$

QUESTION ANALYTICS +

Q. 15 Solution Video | Have any Doubt ?

In which of these quadrilaterals, do the diagonal bisect each other?

A Rhombus — Correct Option

B Trapezium

C Parallelogram — Correct Option

D Square — Correct Option

YOUR ANSWER - NA | CORRECT ANSWER - a,c,d | STATUS - SKIPPED

Solution :
(a, c, d)

QUESTION ANALYTICS +

Q. 16 FAQ | Solution Video | Have any Doubt ?

Which of the following word that is FARTHEST in meaning to the bold word in capital letters?
DENOUNCE

A Defend — Correct Option

B Gather

C Fight

D Extol — Correct Option

YOUR ANSWER - NA | CORRECT ANSWER - a,d | STATUS - SKIPPED

Solution :
(a, d)

QUESTION ANALYTICS +

Q. 17 Solution Video | Have any Doubt ?

Maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is

A 1

B 12 — Correct Option

Solution :
(b)

Given, $$y = -x^3 + 3x^2 + 9x - 27$$

$$\frac{dy}{dx} = -3x^2 + 6x + 9$$

Let, S = slope of tangent to the curve at any point (x, y)

$$S = \frac{dy}{dx} = -3x^2 + 6x + 9$$

$$\frac{dS}{dx} = -6x + 6$$

$$\frac{d^2S}{dx^2} = -6$$

S is maximum when $\frac{dS}{dx} = 0$

$$-6x + 6 = 0$$

$$x = 1$$

Maximum slope $= -3 + 6 + 9 = 12$

C 15

D 9

QUESTION ANALYTICS +

Q. 18 Solution Video | Have any Doubt ? | Bookmark

The eigen values of the following matrix are represented by A and B.

$$A = \begin{bmatrix} 1 & -1 \\ \frac{4}{9} & -\frac{1}{3} \end{bmatrix}$$

The value of $A^2 + B^2 + AB$ is

A $\frac{1}{9}$

B $\frac{4}{9}$

C $\frac{3}{9}$ Correct Option

Solution :
(c)

$$A^2 + B^2 + AB = A^2 + B^2 + 2AB - AB$$
$$= (A + B)^2 - AB$$

Sum of eigen values $(A + B) = 1 - \frac{1}{3}$ (using trace of matrix) $\frac{2}{3}$

Product of eigen values $(AB) = \frac{1}{9}$ (determinant of matrix)

$$(A + B)^2 - AB = \left(\frac{2}{3}\right)^2 - \frac{1}{9} = \frac{3}{9}$$

D $\frac{6}{9}$

QUESTION ANALYTICS +

Q. 19 Solution Video | Have any Doubt ? | Bookmark

The sum of all the real roots of the equation $|x-2|^2 + |x-2| - 2 = 0$ is

A 2

B 3

C 4 Correct Option

Solution :
(c)

Lets assume $|x-2| = m$

Now, $m^2 + m - 2 = 0$

$(m - 1)(m + 2) = 0$

Only admissible value is $m = 1$

$|x-2| = 1$

$x = 3, 1$

Now sum of real roots $= 3 + 1 = 4$

D None of these

QUESTION ANALYTICS +

Q. 20 FAQ | Solution Video | Have any Doubt ? | Bookmark

Prof. J just had a new phone installed in her office. She recalls that its extension number is 4 digits, starting with 123. She knows that the last digit is one of 5 and 7, but both are equally likely. Since she is in a hurry to find out the number, she dials 1235 from that phone and gets busy tone. She concludes that 1235 must be the correct number. Assuming that any 4-digit extension number is busy at any given time with a probability of 1% (independently of the other phones in the system), what is the probability that Prof. J was wrong in her conclusion?

A $\frac{1}{101}$ Correct Option

Solution :
(a)

$$P\left(\frac{\text{Wrong Conclusion}}{\text{1235 is busy}}\right) = P\left(\frac{\text{1235 is not her No.}}{\text{1235 is busy}}\right)$$

$$= \frac{P(\text{1235 not her No.} \cap \text{1235 is busy})}{P(\text{1235 is busy})}$$

P(1235 is busy):

Two case:

1. Her no. and busy
2. Not her no. of busy

(1) $P(\text{Her No.})P\left(\frac{\text{Busy}}{\text{Her No.}}\right) = \frac{1}{2} \times 1$

(2) $P(\text{Not her No.})\, P\left(\frac{\text{Busy}}{\text{Not her No.}}\right) = \frac{1}{2} \times \frac{1}{100}$

$$\Rightarrow \quad P(\text{1235 is busy}) = \frac{1}{2} \times \frac{1}{200} = \frac{101}{200}$$

Thus, $\frac{P(\text{1235 not her no.} \cap \text{1235 is busy})}{P(\text{1235 is busy})}$

$$= \frac{\frac{1}{2} \times \frac{1}{100}}{\frac{101}{200}} = \frac{1}{101}$$

B 0.5

C $\frac{100}{101}$

D 0.01

QUESTION ANALYTICS +

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Q. 21 Solution Video | Have any Doubt ?

10% of all E-mail you receive is spam. Your spam filter is 90% reliable: that is, 90% of the mails it marks as spam are indeed spam and 90% of spam mails are correctly labelled as spam. If you see a mail marked spam by your filter, what is the probability that it really is spam?

A 10%

B 50% — Correct Option

Solution :
(b)
Out of 100 mails, 10 are spam. The filter will label 9 of 10 spam as spam and 9 of 90 non-spam as spam. So 18 are labelled spam, of which 9 are actually spam. You can compute the same result more formally using conditional probabilities.

C 70%

D 90%

QUESTION ANALYTICS +

Q. 22 Solution Video | Have any Doubt ?

A trader mixes three varieties of groundnuts costing Rs 50, Rs 20 and Rs 30 per kg in the ratio 2 : 4 : 3 in terms of weight and sells the mixture at Rs 33 per kg. What percentage of profit does he make?

A 10 — Correct Option

Solution :
(a)

Suppose he bought 2 kg, 4 kg, and 3 kg of three varieties

$$\text{Cost prime of 9 kg} = 2 \times 50 + 4 \times 20 + 3 \times 30$$
$$= \text{Rs } 270$$
$$\text{Selling prime of 9 kg} = 9 \times 33 = \text{Rs } 297$$
$$\therefore \quad \%\ \text{profit} = \frac{27}{270} \times 100 = 10\%$$

B 12

C 14

D 16

QUESTION ANALYTICS +

Q. 23 FAQ | Solution Video | Have any Doubt ?

The value of b for which the system of equations,

$$2x - 3y + 6z - 5t = 3$$
$$y - 4z + t = 1$$
$$4x - 5y + 8z - 9t = b$$

have infinite number of solution is

A 6

B 7 — Correct Option

Solution :
(b)

The augmented matrix,

$$C = [A \mid B]$$

$$A = \begin{bmatrix} 2 & -3 & 6 & -5 \\ 0 & 1 & -4 & 1 \\ 4 & -5 & 8 & -9 \end{bmatrix}$$

$$C = \left[\begin{array}{cccc|c} 2 & -3 & 6 & -5 & 3 \\ 0 & 1 & -4 & 1 & 1 \\ 4 & -5 & 8 & -9 & b \end{array}\right]$$

Applying $R_3 \to R_3 - 2R_1$

$$\left[\begin{array}{cccc|c} 2 & -3 & 6 & -5 & 3 \end{array}\right.$$

$$C \sim \left[\begin{array}{cccc|c} 0 & 1 & -4 & 1 & 1 \\ 0 & 1 & -4 & 1 & b-6 \end{array}\right]$$

Applying $R_3 \to R_3 - R_2$

$$C \sim \left[\begin{array}{cccc|c} 2 & -3 & 6 & -5 & 3 \\ 0 & 1 & -4 & 1 & 1 \\ 0 & 0 & 0 & 0 & b-7 \end{array}\right]$$

There are infinite solution if,

$$R(A) = R(C) = 2$$
$$b - 7 = 0$$
$$b = 7$$

C 9

D None of the above

QUESTION ANALYTICS +

Q. 24 Solution Video | Have any Doubt ?

A hemispherical tank full of water is emptied by a pipe at the rate of $3\frac{4}{7}$ liters per second. How much time in seconds will it take to empty half the tank, if it is 3 m in diameter?

A 990 seconds — Correct Option

Solution :
(a)

Radius of the hemispherical tank $= \frac{3}{2}$m

$$\text{Volume of the tank} = \frac{2}{3} \times \frac{22}{7} \times \left(\frac{3}{2}\right)^3 = \frac{99}{14}\text{m}^3$$

So, the volume of the water to be emptied

$$= \frac{1}{2} \times \frac{99}{14}\text{m}^3 = \frac{99}{28} \times 1000 \text{ liters}$$

Since $\frac{25}{7}$ litres of water is emptied in one second

$\therefore \frac{99000}{28}$ litres of water will emptied in $\frac{99000}{28} \times \frac{7}{25}$sec $= 990$ seconds

B 870 seconds

C 560 seconds

D 287 seconds

QUESTION ANALYTICS +

Q. 25 FAQ | Solution Video | Have any Doubt ?

Consider the function $f(x) = x^2 e^{-x}$. The maximum value occurs when x is equal to _____.

2 — Correct Option

Solution :
2

$$f(x) = x^2 e^{-x}$$
$$f'(x) = -x^2 e^{-x} + e^{-x} \cdot 2x$$

Putting, $f'(x) = 0$

$$e^{-x}(2x - x^2) = 0$$

We get, $x = 0$ or $x = 2$ are the stationary points.

$$f''(x) = e^{-x}(2 - 2x) - e^{-x}(2x - x^2)$$
$$= e^{-x}(2 - 2x - 2x + x^2)$$
$$= e^{-x}(x^2 - 4x + 2)$$

At $x = 0$

$f''(x) = 2 > 0$ [we have minima at $x = 0$]

At $x = 2$

$f''(x) = -2e^{-2} < 0$ [we have maxima at $x = 2$]

QUESTION ANALYTICS +

Q. 26 Have any Doubt ?

The value of '$a + b$' such that the surface $ax^2 - byz = (a+2)x$ is orthogonal to the surface $4x^2y + z^3 = 4$ at the point $(1, -1, 2)$ is _____ .

3.5 (3.4 - 3.6) — Correct Option

Solution :
3.5 (3.4 - 3.6)

$$\phi_1 = ax^2 - byz - (a+2)x$$

$$\nabla\phi_1 = [2ax - (a+2)]\hat{i} - bz\hat{j} - by\hat{k}$$

$$\nabla\phi_1 \text{ at } (1,-1,2) = (a-2)\hat{i} - 2b\hat{j} + b\hat{k}$$

$$\phi_2 = 4x^2y + z^3 - 4$$

$$\nabla\phi_2 = 8xy\hat{i} + 4x^2\hat{j} + 3z^2\hat{k}$$

$$\nabla\phi_2 \text{ at } (1,-1,2) = -8\hat{i} + 4\hat{j} + 12\hat{k}$$

Since surfaces are orthogonal to each other at $(1, -1, 2)$

$$\nabla\phi_1 \cdot \nabla\phi_2 = 0$$

$$\left[(a-2)\hat{i} - 2b\hat{j} + b\hat{k}\right] \cdot \left[-8\hat{i} + 4\hat{j} + 12\hat{k}\right] = 0$$

$$-8(a-2) - 8b + 12b = 0 \qquad \ldots(i)$$

Also point $(1, -1, 2)$ lies on the surface

$$a \times 1 + 2b = (a+2) \times 1$$

$$b = 1$$

Putting this in equation (i), we get

$$-8(a-2) - 8 + 12 = 0$$

$$a - 2 = -\frac{1}{8} \times (-4) = 0.5$$

$$a = 2.5$$

$$\therefore \quad a + b = 3.5$$

QUESTION ANALYTICS +

Q. 27 — FAQ | Solution Video | Have any Doubt ?

The area bounded by the curve $y = \sin^{-1} x$ and the line $x = 0$ $|y| = \frac{\pi}{2}$ will be _____ square unit.

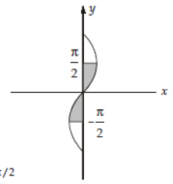
2 — Correct Option

Solution :
2

$$y = \sin^{-1} x$$

$$x = \sin y$$

$$\text{Area of shaded region} = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin y \, dy$$



$$= 2\int_{0}^{\frac{\pi}{2}} \sin y \, dy = 2[-\cos y]_0^{\pi/2}$$

$$= 2[-(0-1)] = 2$$

QUESTION ANALYTICS +

Q. 28 — FAQ | Solution Video | Have any Doubt ?

If the probability that an individual suffers a bad reaction from a certain injection is 0.001, out of 2000 individuals, the probability of more than 1 bad reaction is _____. (Upto 3 decimal places)

0.595 (0.59 - 0.61) — Correct Option

Solution :
0.595 (0.59 - 0.61)

$$P = 0.001, \qquad n = 2000$$

$$m = np = 2000 \times 0.001 = 2$$

$$P(r) = \frac{e^{-m}m^r}{r!} = \frac{e^{-2}2^r}{r!} = \frac{1}{e^2} \times \frac{2^r}{r!}$$

$$P(\text{more than } 1) = P(2) + P(3) + \ldots\ldots + P(2000)$$

$$= 1 - [P(0) + P(1)]$$

$$= 1 - \left[\frac{e^{-2}(2)^0}{0!} + \frac{e^{-2}(2)^1}{1!}\right]$$

$$= 1 - 3e^{-2} = 1 - 3 \times 0.135 = 0.595$$

QUESTION ANALYTICS +

Q. 29

Solution Video | Have any Doubt ?

A and B are partners in a business A contributes 1/4 of the capital for 15 months and B receives 2/3 of the profit. For how long B's money was used (in months) _____ .

10 — Correct Option

Solution :
10

Let the total profit be Rs Z then,

$$B\text{'s share} = \text{Rs}\frac{2Z}{3}$$

$$A\text{'s share} = \text{Rs}\left(Z - \frac{2Z}{3}\right) = \text{Rs}\frac{Z}{3}$$

$$\therefore \quad A : B = \frac{Z}{3} : \frac{2Z}{3} = 1 : 2$$

Let the total capital be Rs x and suppose B's money was used for x months.

Then, $$\frac{\frac{1}{4} \times x \times 15}{\frac{3}{4} \times x \times y} = \frac{1}{2}$$

$$y = 10$$

Thus, B's money was used for 10 months.

QUESTION ANALYTICS +

Q. 30

Solution Video | Have any Doubt ?

Area of a square inscribed in a circle is 4 cm^2, the diameter of the circle is _____ cm. (Upto 3 decimal places)

2.828 (2.500 - 3.100) — Correct Option

Solution :
2.828 (2.500 - 3.100)

Given area of square is 4 cm^2

Hence, $AB = AC = BD = CD = 2$ cm

Diagonal $BC = 2\sqrt{2}$ cm

QUESTION ANALYTICS +

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BOOKMARKS
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ENGINEERING MATHEMATICS + GENERAL APTITUDE (GATE - 2021) - REPORTS

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Q. 31 Solution Video | Have any Doubt ?

The last day of a century cannot be

A. Tuesday — Correct Option
B. Thursday — Correct Option
C. Saturday — Correct Option
D. Sunday

YOUR ANSWER - NA | CORRECT ANSWER - a,b,c | STATUS - SKIPPED

Solution :

(a, b, c)

100 years contain 5 odd days

$\therefore$ Last day of 1st century is Friday

200 years contain $5 \times 2 = 3$ odd days

$\therefore$ Last day of 2nd century is Wednesday

300 years contain $5 \times 3 = 15 = 1$ odd day

Last day of 3rd century is Monday

400 years contain odd day

$\therefore$ Last day of 4th century is Sunday

This cycle is repeated

$\therefore$ Last day of century can not be Tuesday, Thursday or Saturday.

QUESTION ANALYTICS +

Q. 32 FAQ | Solution Video | Have any Doubt ?

Which of the following are Eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$?

A. (4, 1) — Correct Option
B. (1, 4)
C. (1, −1) — Correct Option
D. (−1, −1)

YOUR ANSWER - NA | CORRECT ANSWER - a,c | STATUS - SKIPPED

Solution :

(a, c)

The characteristic equation is $[A - \lambda I] = 0$

$$\begin{bmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{bmatrix} = 0$$

$$\lambda^2 - 7\lambda + 6 = 0$$

$$(\lambda - 6)(\lambda - 1) = 0$$

$$\therefore \quad \lambda = 1, 6$$

Thus the eigen values are 6 and 1.

If x, y be the components of an eigen vector corresponding to the eigen value λ, then

$$[A - \lambda I]X = \begin{bmatrix} 5-\lambda & 4 \\ 1 & 2-\lambda \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 0$$

Corresponding to $\lambda = 6$, we have

$$\begin{bmatrix} -1 & 4 \\ 1 & -4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 0$$

Which gives only one independent equation $-x + 4y = 0$

$$\therefore \quad \frac{x}{4} = \frac{y}{1} \text{ giving the eigen vector } (4, 1)$$

Corresponding to $\lambda = 1$, we have

$$\begin{bmatrix} 4 & 4 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = 0$$

which gives only one independent equation $x + y = 0$

$\therefore \quad \frac{x}{1} = \frac{y}{-1}$ giving the eigen vector $(1, -1)$

QUESTION ANALYTICS +

Q. 33

Solution Video | Have any Doubt ?

Consider the following statements and select correct options.

A. Volume of a cube having each side 4 cm is greater than volume of a parallelepiped of length 5 cm, breadth 3 cm and height 4 cm. — Correct Option

B. Volume of a cylinder of radius 3 cm and length 3 cm is lesser than volume of a sphere having radius 3 cm. — Correct Option

C. Volume of a cube having each side 4 cm is lesser than volume of a parallelepiped of length 5 cm, breadth 3 cm and height 4 cm.

D. Volume of a cylinder of radius 3 cm and length 3 cm is greater than volume of a sphere having radius 3 cm.

YOUR ANSWER - NA | CORRECT ANSWER - a,b | STATUS - SKIPPED

Solution :

(a, b)

$$\text{Volume of parallelepiped} = 5 \times 3 \times 4 \text{ cm}^3 = 60 \text{ cm}^3$$

$$\text{Volume of cube} = (4)^3 \text{ cm}^3 = 64 \text{ cm}^3$$

$$\text{Volume of cylinder} = \frac{22}{7} \times 3 \times 3 \times 3 = 84.86 \text{ cm}^3$$

$$\text{Volume of sphere} = \frac{4}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 = 113.14 \text{ cm}^3$$

QUESTION ANALYTICS +