JEE Main 2024 Paper 2A (B.Arch) Apr 12 Single sitting Question Paper

Conducted by the National Testing Agency (NTA)

Time Allowed: 3 Hours **B.Arch** **Maximum Marks: 400**

General Instructions

(i) This is **Paper 2A (B.Arch)** of **JEE (Main) 2024**, conducted by the National Testing Agency on **12 Apr 2024**.

(ii) The paper contains **82 questions**; attempt **77** as specified in the section table. The maximum score is **400 marks**.

(iii) Multiple choice questions have four options. Select one answer. Each correct answer carries **4 marks**; an incorrect answer carries **−1 mark**.

(iv) Numerical value questions carry **4 marks** for a correct answer and **−1 marks** for an incorrect answer. Unanswered questions carry **0 marks**.

(v) The Drawing section contains **two questions of 50 marks each**. Follow the alternatives and instructions printed within each question.

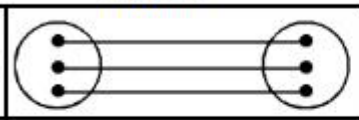
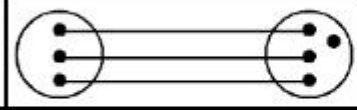
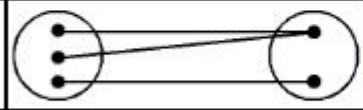
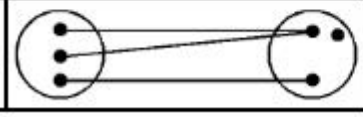
(vi) In Mathematics Section B, attempt **any five of the ten** numerical value questions.

Section	Questions	To attempt	Marks
Mathematics Section A	20	20	80
Mathematics Section B	10	5	20
Aptitude Test	50	50	200
Drawing	2	2	100

Mathematics Section A

1. 4 marks

Match **List I** with **List II**

LIST I		LIST II	
A.		I.	Neither surjective nor injective
B.		II.	Surjective but not injective
C.		III.	Injective but not surjective
D.		IV.	Injective and surjective

Choose the correct answer from the options given below:

(1) A-IV, B-II, C-III, D-I

(2) A-I, B-II, C-IV, D-III

(3) A-IV, B-III, C-II, D-I

(4) A-IV, B-III, C-I, D-II

2. 4 marks

A college awarded 38 medals for cricket, 15 for tennis and 20 for football. If these medals were bagged by a total of 58 students and only 3 students got medals for all the three games, then how many students received medals for exactly two of the three games?

(1) 9

(2) 18

(3) 12

(4) 6

3. 4 marks

If α and β are the roots of $ax^2 + bx + c = 0$, then the value of $\frac{1}{(a\alpha+b)^2} + \frac{1}{(a\beta+b)^2}$ is

(1) $\frac{b^2-2c}{c^2}$

(2) $\frac{b^2-2ac}{(ac)^2}$

(3) $\frac{b^2-2c}{c}$

(4) $\frac{b^2-2ac}{ac}$

4. 4 marks

Let $A=\begin{bmatrix}1 & 2 & 3 & 4\\ 5 & 6 & 7 & 8\\ 9 & 9 & 9 & 9\\ 8 & 8 & 8 & 8\end{bmatrix}$, then determinant of A =

(1) -1 (2) 0

(3) 1 (4) 72

5. 4 marks

In how many ways can we select four cards from an ordinary pack of playing cards so that two of them are of the same denomination and the remaining two are of some other same denomination?

(1) 78 (2) 150

(3) 715 (4) 5616

6. 4 marks

If the coefficient of x^7 and x^8 in the expansion of $\left(2+\frac{x}{3}\right)^n$ are equal, then n is

(1) 56 (2) 55

(3) 45 (4) 15

7. 4 marks

The sum of all those terms of the arithmetic progression 2, 6, 10, 14, ... , 598 which are **not** divisible by 3, is equal to

(1) 30300 (2) 30000

(3) 29400 (4) 30600

8. 4 marks

The first two terms of a G.P. are x^{-3} and x^n, respectively. If x^{42} is the sixth term of the same progression, then n^2 is equal to

(1) 16 (2) 9

(3) 36 (4) 25

9. 4 marks

Suppose L is the line joining the points (0, 0) and (1, 2). If a line parallel to L meets the curve $y = 2x^2 + 3x + 1$ only at a single point P, then the point P is

(1) $\left(\frac{1}{4}, \frac{3}{8}\right)$ (2) $(2, 15)$

(3) $\left(\frac{-1}{4}, \frac{3}{8}\right)$ (4) $\left(\frac{-3}{4}, \frac{5}{16}\right)$

10. 4 marks

A manufacturer can sell x items at a price of ₹ $\left(5-\frac{x}{100}\right)$ each. The cost price of x items is ₹ $\left(\frac{x}{5}+500\right)$. The number of items he should sell to reach maximum profit is

(1) 100 (2) 240

(3) 500 (4) 480

11. 4 marks

The value of $\int_0^1 \log_e\left(\frac{1}{x}-1\right)dx$ is

(1) 0 (2) $\frac{1}{2}$

(3) 1 (4) 2

12. 4 marks

If $(1+\cos x)\frac{dy}{dx}-(y-3)\sin x = 0$ and $y(0) = 0$, then the value of $y\left(\frac{\pi}{2}\right)$ is

(1) –3 (2) 3

(3) 9 (4) 6

13. 4 marks

If a straight line passing through point P (3, –5) is such that its intercepted portion between the co-ordinate axes is bisected at P, then the equation of the line is

(1) $5x + 3y + 30 = 0$ (2) $5x - 3y - 30 = 0$

(3) $5x - 3y + 30 = 0$ (4) $-5x - 3y + 30 = 0$

14. 4 marks

The intercept on the line $x = y$ by the circle $x^2 + y^2 - 2y = 0$ is AB. The equation of the circle with AB as a diameter is

(1) $x^2 + y^2 + x + y = 0$ (2) $x^2 + y^2 - x - y = 0$

(3) $x^2 + y^2 - x + y = 0$ (4) $x^2 + y^2 + x - y = 0$

15. 4 marks

If the foot of the perpendicular from the point (0, 0, 0) on the line $\frac{x+2}{5} = \frac{y+2}{2} = \frac{z+8}{3}$ is (a, b, c), then $a^2 + b^2 + c^2$ is

(1) 34 (2) 14

(3) 24 (4) 44

16. 4 marks

If the vectors $\overrightarrow{AB} = 3\hat{i} + 8\hat{k}$ and $\overrightarrow{AC} = 5\hat{i} - 2\hat{j} + 6\hat{k}$ are the sides of a triangle ABC, then the length of the median through A is

(1) $\sqrt{33}$ (2) $\sqrt{66}$

(3) $\sqrt{56}$ (4) $\sqrt{72}$

17. 4 marks

If $\vec{a} = 6\hat{i} + 2\hat{j} - \lambda_1\hat{k}$, $\vec{b} = 3\hat{i} + (3 - \lambda_2)\hat{j} + 2\hat{k}$ and $\vec{c} = 2\hat{i} + (1 + \lambda_3)\hat{j} - 3\hat{k}$ are three vectors such that $\vec{a} = 3\vec{c}$ and $\vec{b}$ is perpendicular to $\vec{c}$ then $(\lambda_1, \lambda_2, \lambda_3)$ is

(1) $\left(9, 21, -\frac{1}{3}\right)$ (2) $\left(9, 3, -\frac{1}{3}\right)$

(3) $\left(\frac{1}{3}, -\frac{1}{3}, \frac{1}{3}\right)$ (4) $(3, 3, 1)$

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18. 4 marks

Let x_1, x_2, x_3, x_4, x_5 be observations with mean m and standard deviation s. Then, which of the following statements are correct:

A. Mean of the observations $x_1 + k, x_2 + k, x_3 + k, x_4 + k, x_5 + k$ is $m + 5k$
B. Mean of the observations $kx_1, kx_2, kx_3, kx_4, kx_5$ is km.
C. The standard deviation of the observations $x_1 + k, x_2 + k, x_3 + k, x_4 + k, x_5 + k$ is s.
D. The standard deviation of the observations $kx_1, kx_2, kx_3, kx_4, kx_5$ is $k^5 s$.

Choose the correct answer from the options given below :

(1) A, B, C, D
(2) A, C only
(3) B, D only
(4) B, C only

19. 4 marks

Let the area of the region enclosed between the two circles $x^2 + y^2 = a^2$ and $(x-a)^2 + y^2 = a^2$ be $\frac{m}{3}\left(4\pi - 3\sqrt{3}\right)$ sq. units for some $a \geq 2$. If a is a root of $x^3 - 3x^2 - 6x + 8 = 0$, then

(1) $m^2 = a^4$
(2) $m^2 = a^3$
(3) $m^4 = a^2$
(4) $m^3 = a^2$

20. 4 marks

Suppose $\begin{vmatrix} f'(x) & f(x) \\ f''(x) & f'(x) \end{vmatrix} = 0$, where $f(x)$ is continuously differentiable function with $f'(x) \neq 0 \ \forall \ x \in \mathbb{R}$ and satisfies $f(0)=1$ and $f'(0)=4$. If $f(x) = e^{\lambda x} + \mu$, where $\lambda, \mu \in \mathbb{R}$ then the value of $\lambda^2+\mu^2$ is

(1) 2
(2) 4
(3) 8
(4) 16

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Mathematics Section B

21. Numerical value · 4 marks

The equations $ax^2 + bx + a = 0$, $(a, b \in \mathbb{R})$ and $x^3 - 2x^2 + 2x - 1 = 0$ have two common roots. Then the value of $a + b$ is _____.

22. Numerical value · 4 marks

Let A be a matrix satisfying $A^3 = 3A + 2I$ where $A \neq nI$, $n \in \mathbb{Z}$. If $A^2 + \alpha A + \beta I = O$, then maximum value of $|\alpha + \beta|$ is _____.

23. Numerical value · 4 marks

An equilateral triangle is inscribed in the ellipse $\frac{x^2}{3} + y^2 = 1$ such that one of the vertex of the triangle is $(0, 1)$ and one of the altitude of the triangle is along the y-axis. If A is the area of the equilateral triangle. Then $625A^2$ is equal to _____.

24. Numerical value · 4 marks

The volume of the greatest cylinder that can be inscribed in a cone of height $\frac{3}{\sqrt[3]{\pi}}$ and semi-vertical angle 45° is _____.

25. Numerical value · 4 marks

If the function $f(x)$ is defined as $f(x) = \begin{vmatrix} \frac{1}{1+e^{\sin x}} & \sin x \\ \sqrt{1-x^2} & 2 \end{vmatrix}$. Then the value of $\frac{1}{\pi}\int_{-\pi/2}^{\pi/2} f(x)\,dx$ is equal to _____.

26. Numerical value · 4 marks

A line touches the curve $y = y(x)$ at a point (x, y) having slope $\frac{1+y^2}{1+x^2}$,where $x > 0$. If $y(2) = 1$, $y(3) = \frac{\alpha}{\beta}$ and $gcd\{\alpha, \beta\} = 1$, then the value of $\alpha + \beta$ is _____.

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27. Numerical value · 4 marks

The equation of the base of an equilateral triangle is $x + y = 1$ and the opposite vertex has co-ordinates $(-3, 2)$. The area of the triangle (in square units) is represented by A, then the value of $\sqrt{3}A$ is _____.

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28. Numerical value · 4 marks

Let R be the point $(13, -8, 10)$ and $P(\alpha, \beta, \lambda)$ be the image of the point Q $(5, 2, 1)$ in the line $x - 2 = 3 - y = z + 1$. Then the square of the area of the triangle PQR is _____.

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29. Numerical value · 4 marks

A hospital conducts a free eye check-up drive at 3 different locations A, B and C of a city. The number of people that came for test at A is thrice as much as that at B, and number of people that came at B is same as that at C. The results show that 4% population at A, 2% at B and 3% at C have poor eye-sight. If a person from the city goes for an army job and is found to have poor eye-sight, and the probability that he is not from location C is $\frac{p}{q}$, where $\frac{p}{q}$ is in simplest form, then value of $(p + q)$ is _____.

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30. Numerical value · 4 marks

The number of pairs (x, y) satisfying the equations $\sin x + \sin y = \sin(x + y)$ and $|x| + |y| = 1$ is _____.

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31. 4 marks

In a certain word code, EXHAUST is written as CZFCSUR. How is NETWORK written in that code ?

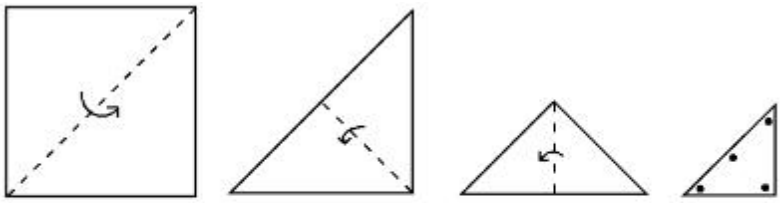
(1) LCVYQTI
(2) LGVYQTM
(3) LGRYMTI
(4) LCRYQTM

32. 4 marks

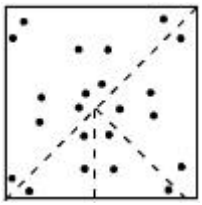
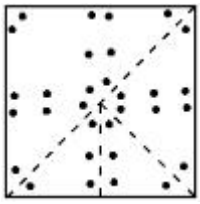
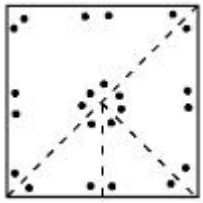
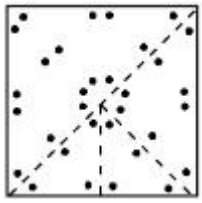
In a code language, if "BRICK" is written as "CQJBL", then "CEMENT" is _____

(1) DDOFOS
(2) DDODOS
(3) DDNDOS
(4) DDNFOS

33. 4 marks



When the paper is folded in a given pattern and is cut at the end. Identify which pattern is formed when the paper is unfold?

(1) 
(2) 
(3) 
(4) 

34. 4 marks

Match List I with List II

LIST I (Components/Material)		LIST II (Functions)	
A.	Cement	I.	Load Bearing
B.	Window	II.	Tensile strength
C.	Foundation	III.	Setting time
D.	Steel	IV.	Glazing

Choose the correct answer from the options given below:

(1) A-I, B-IV, C-III, D-II
(2) A-I, B-II, C-III, D-IV
(3) A-III, B-IV, C-I, D-II
(4) A-IV, B-III, C-II, D-I

35. 4 marks

Match List I with List II

LIST I(struchture)		LIST II(places)	
A.	Humayun's Tomb	I.	Gujarat
B.	Bibi Ka Maqbara	II.	New Delhi
C.	Hussain Doshi Gufa	III.	Maharashtra
D.	Group of monuments, Mahabalipuram	IV.	Tamilnadu

Choose the correct answer from the options given below:

(1) A-II, B-IV, C-I, D-III
(2) A-I, B-III, C-II, D-IV
(3) A-II, B-III, C-I, D-IV
(4) A-II, B-I, C-IV, D-III

36. 4 marks

Match List I with List II

LIST I		LIST II	
A.	Stairs	I.	Key stone
B.	Door	II.	Toothing
C.	Arch	III.	Jamb
D.	Brick work	IV.	Tread

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-I, D-II
(2) A-II, B-I, C-III, D-IV
(3) A-I, B-III, C-IV, D-II
(4) A-III, B-IV, C-II, D-I

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37. 4 marks

Give below are two statements :

Statement I : A partition wall is defined as an internal wall whose function is to divide the space within the building.

Statement II : Partition wall could be load bearing or non-load bearing.

In the light of the above statements, choose the ***most appropriate*** answer from the options given below:

(1) Both Statement I and Statement II are correct
(2) Both Statement I and Statement II are incorrect
(3) Statement I is correct but Statement II is incorrect
(4) Statement I is incorrect but Statement II is correct

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38. 4 marks

Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R** :
Assertion A : Social integration at work place is necessary.
Reason R : There are many backward classes in society.
In the light of the above statements, choose the ***correct*** answer from the options given below :

(1) Both **A** and **R** are true and **R** is the correct explanation of **A**
(2) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
(3) **A** is true but **R** is false
(4) **A** is false but **R** is true

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39. 4 marks

Primary colours are_____.

(1) Red, Blue, Yellow
(2) Red, Green, Blue
(3) Red, Violet, Yellow
(4) Red, Green, Yellow

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40. 4 marks

The stairs kept in motion by a revolving drum is known as a _____.

(1) Escalator
(2) Lift
(3) Elevator
(4) Revolving stairs

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41. 4 marks

Which of the following structure does not have a dome?

(1) Gol Gumbaz
(2) Avicii Arena
(3) St. Paul's Cathedral
(4) The Shard

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42. 4 marks

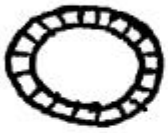
Given below is the famous temple in India. Identify the style of temple architecture adopted in the temple.



(1) Nagara
(2) Dravidian
(3) Vesara
(4) Orissan

43. 4 marks

Match List I with List II

LIST I(Plan)		LIST II(Building Name)	
A.		I.	Taj Mahal
B.		II.	Qutub Minar, New Delhi
C.		III.	Matri Mandir, Auroville
D.		IV.	Sanchi Stupa

Choose the correct answer from the options given below:

(1) A-IV, B-II, C-III, D-I
(2) A-II, B-III, C-IV, D-I
(3) A-III, B-II, C-IV, D-I
(4) A-IV, B-III, C-II, D-I

44. 4 marks

The botanical name of "MANGO" tree is

(1) Azadirachita Indica
(2) Mangifera Indica
(3) Delonux Indica
(4) Delonux Regia

45. 4 marks

Scientific study of human body measurements :

(1) Depth Perception
(2) Anthrology
(3) Axenometry
(4) Anthropometry

46. 4 marks

FAR stands for

(1) Facade Area Ratio
(2) Floor Area Ratio
(3) Fire Accessible Ramp
(4) Fire Arch Ratio

47. 4 marks

On an engineer scale, 1 cm = 10 m. Identify the representative fraction (R.F.)

(1) 1/100
(2) 1/10
(3) 1/1000
(4) 1/10000

48. 4 marks

Identify the iconic Landmark :



(1) Taipei 101
(2) One World Trade Center
(3) Sydney Opera House
(4) Shanghai World Financial Center

49. 4 marks

Identify the name of the Landmark :



(1) Crystal Palace, London
(2) The Louvre, Paris
(3) German Pavilion for World exibition, Barcelona
(4) Vitra Design Museum, Basel

50. 4 marks

Identify the famous Monument in the given picture.



(1) Chand Baoli
(2) Stepped Pyramid
(3) Golden Lily Pond
(4) Airavates-vara Temple

51. 4 marks

A man is facing towards East and turns through 45° anti clockwise, again 180° anticlockwise and than turns through 270° clockwise. In which direction is he facing now?

(1) South-East
(2) South-West
(3) South
(4) North-East

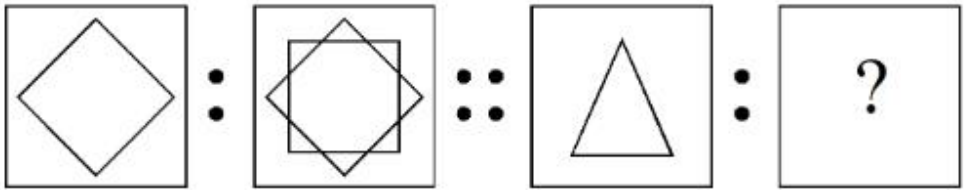
52. 4 marks

The 'lightness or darkness' of a colour is defined as :

(1) Hue
(2) Brightless
(3) Dullness
(4) Value

53. 4 marks

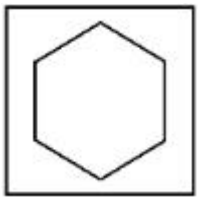
Select a figure amongst the answer figures which will continue the same series or pattern as established by the problem figures.



(1) 

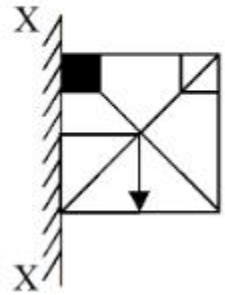
(2) 

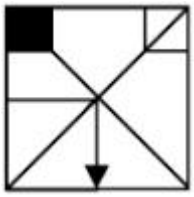
(3) 

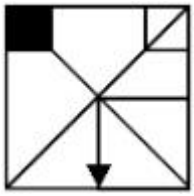
(4) 

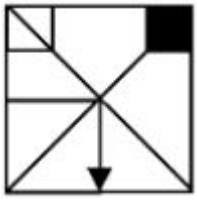
54. 4 marks

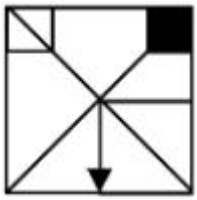
Identify the true mirror image of the figure amongst the answer figures with respect to-X-X



(1) 

(2) 

(3) 

(4) 

55. 4 marks

Identify the mirror image of given word :

PROGRESS

(1) PROGRESS

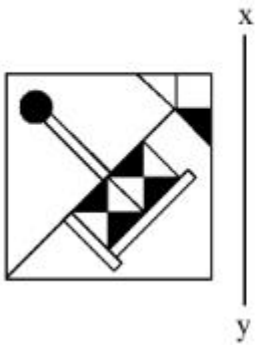
(2) SSERGORP

(3) SSERGORP

(4) SSERGORP

56. 4 marks

Identify the correct mirror image of the given figure along x-y axis :



(1) 

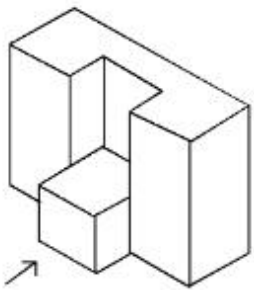
(2) 

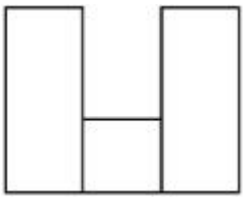
(3) 

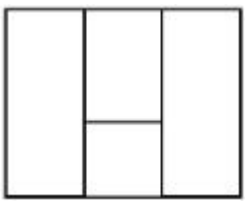
(4) 

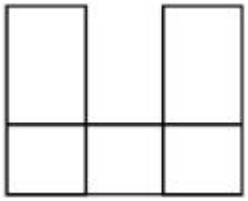
57. 4 marks

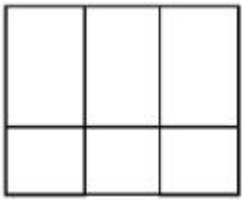
The question figure shows the 3D view of an object. Identify the correct view of the object looking in the direction of arrow.



(1) 

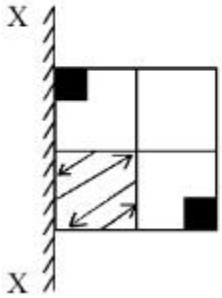
(2) 

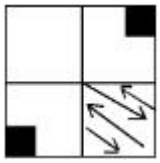
(3) 

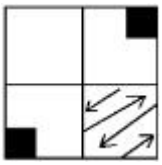
(4) 

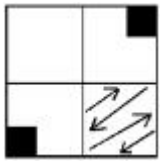
58. 4 marks

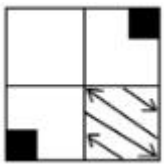
Identify the true mirror image of the figure amongst the answer figures with respect to X-X :



(1) 

(2) 

(3) 

(4) 

59. 4 marks

'Kuchipudi' is a unique dance from which state ?

(1) Madhya Pradesh
(2) Tamil Nadu
(3) Kerala
(4) Andhra Pradesh

60. 4 marks

Which of the below given material is not a plaster type ?

(1) Gypsum
(2) Lime
(3) Cement
(4) MDF

61. 4 marks

Who initiated the construction of Qutub-Minar, Delhi?

(1) Muhammad Quli Qutub Shah
(2) Muhammad Azam Shah
(3) Qutub-Ud-din-Aibak
(4) Iltutmish

62. 4 marks

When is the world Environment Day celebrated?

(1) 5 June
(2) 10 July
(3) 22 March
(4) 15 August

63. 4 marks

Visual weight is associated with :

(1) Emphasis
(2) Texture
(3) Balance
(4) Pattern

64. 4 marks

Lines those branch off of a central point are referred to as :

(1) Rhythm
(2) Repetition
(3) Radiation
(4) Proportion

65. 4 marks

V7 concept of Chandigarh city is associated with which architect?

(1) Patric Geddes
(2) Le Corbusier
(3) Frank O Gehri
(4) Zaha Hadid

66. 4 marks

Who is known as "Father of contemporary architecture" ?

(1) Le Corbusier
(2) Louis Sullivan
(3) Frank Gehry
(4) Norman Foster

67. 4 marks

Who designed 'India Gate'?

(1) Edwin Luytens
(2) Raj-Rewal
(3) George Writtet
(4) Norman Foster

68. 4 marks

Who among the following architects has not won the Pritzker prize till 2019?

(1) B.V. Doshi
(2) I.M. Pie
(3) Arata Isozki
(4) Moshe Safdie

69. 4 marks

Terra cotta is a type of earthen work which is processed by :

(1) Burning at high temperature
(2) Mixing with lime
(3) Compacting with pressure
(4) Drying in the Sun

collegedunia

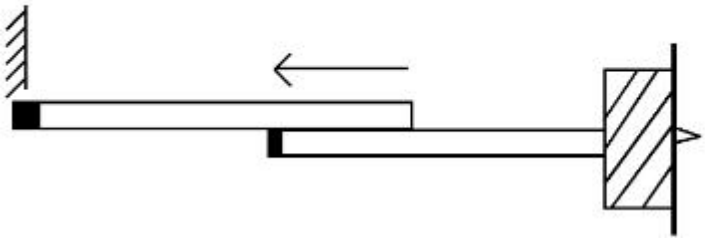
70. 4 marks

Which building material is primarily used as a building material for the Great wall of China?

(1) Timber
(2) Steel
(3) Brick
(4) Concrete

71. 4 marks

Identify the architectural symbol represented in the given figure.



(1) Window
(2) Sliding door
(3) Revolving door
(4) Rolling shutter

72. 4 marks

Percentage of lime content in ordinary Portland cement is

(1) 30% – 40%
(2) 40% – 50%
(3) 60% – 70%
(4) 70% – 80%

73. 4 marks

Sill Level is associated with

(1) Roof
(2) Column
(3) Window
(4) Staircase

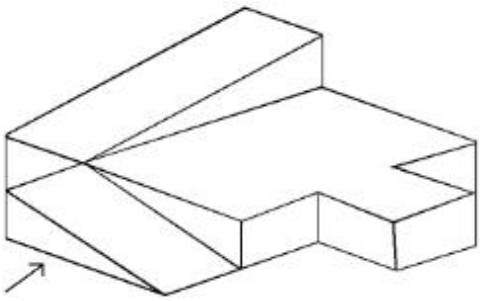
74. 4 marks

What is the terminology for the vertical portion between each tread of the stairs?

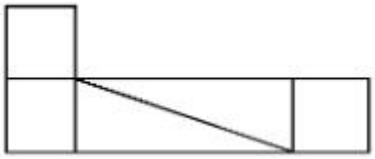
(1) Winder
(2) Riser
(3) Nosing
(4) Going

75. 4 marks

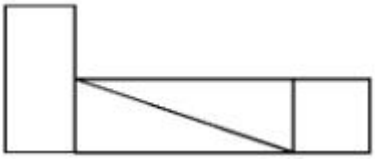
The question figure shows the 3D view of an object. Identify the correct view of the object looking in the direction of arrow :



(1) 

(2) 

(3) 

(4) 

76. 4 marks

Complete the number sequence :

18, 27, 38, 51, ..., 83

(1) 62

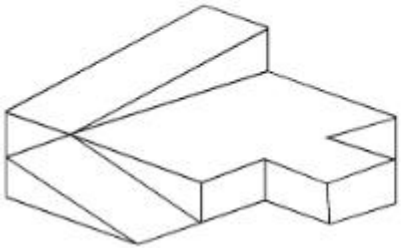
(2) 66

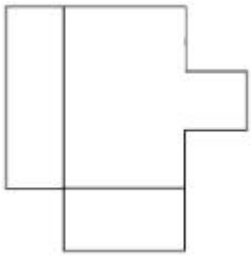
(3) 64

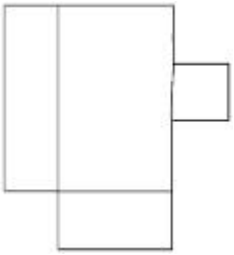
(4) 72

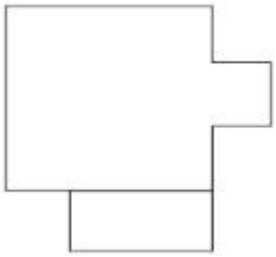
77. 4 marks

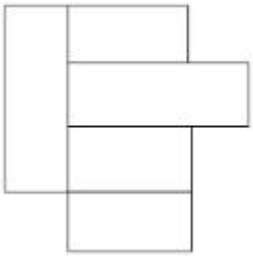
In the question figure a-3-D object is given, Identify the correct top view of the object amongst the answer figures.



(1) 

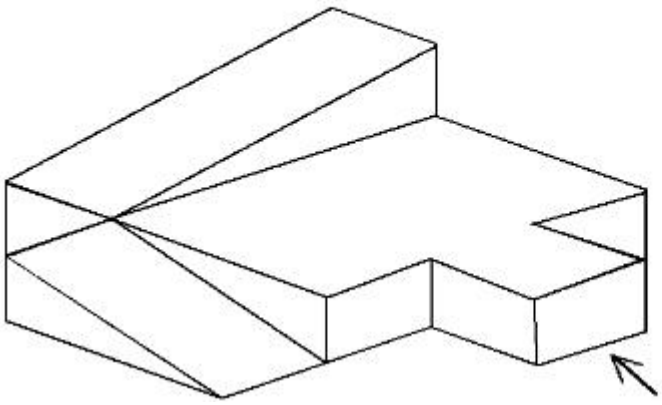
(2) 

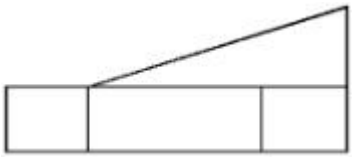
(3) 

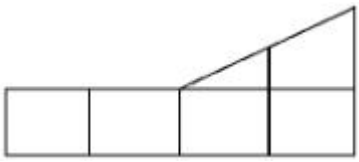
(4) 

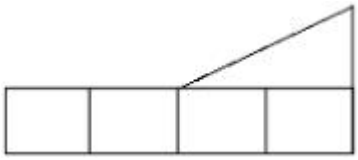
78. 4 marks

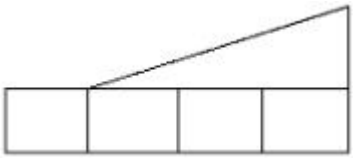
In question figure - 3D object is given, Identify the correct view of the object looking in the direction of the arrow, amongst the answer figures.



(1) 

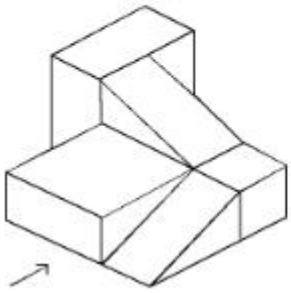
(2) 

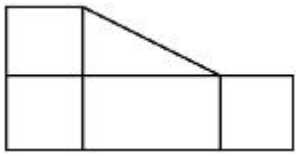
(3) 

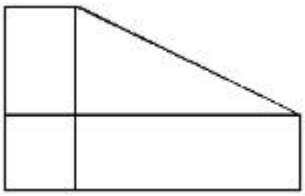
(4) 

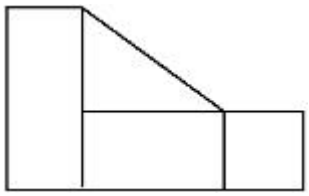
79. 4 marks

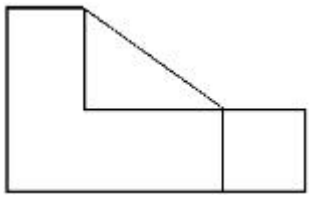
In question figure a 3-D object is given. Identify the correct view of the object looking in the direction of arrow, amongst the answer figures.



(1) 

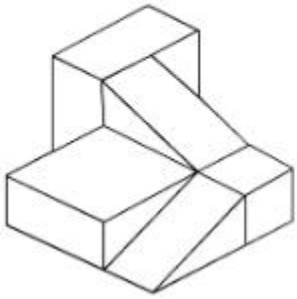
(2) 

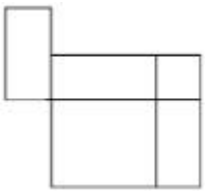
(3) 

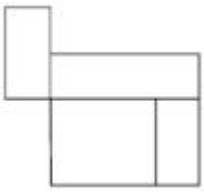
(4) 

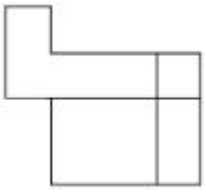
80. 4 marks

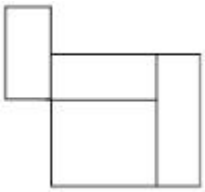
In the question figure a 3-D object is given. Identify the correct top view of the object amongst the answer figures.



(1) 

(2) 

(3) 

(4) 

Drawing

81. 50 marks

Draw the sketch of the image given below in detail:

Use monochromatic colour rendering techniques, light and shadow to represent its depth and intensity.



82. 50 marks

Draw G20 Logo with one Alphabet, two numeric, a triangle, a circle, and a rectangle. Use any 3 colours of your choice

OR

Draw sketch of a road in one point perspective. Imagine the road to be a vehicular road with both side footpath having vendors and hawkers around it. Use colours of your choice.