JEE Main 2020 Paper 2A (B.Arch) Sep 1 Shift 2 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) 2020**, conducted by the National Testing Agency on **1 Sep 2020**.

(ii) The paper contains **77 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 **0 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) All questions are compulsory.

Section	Questions	To attempt	Marks
Mathematics	25	25	100
Aptitude Test	50	50	200
Drawing	2	2	100

Mathematics

1. 4 marks

Let $A = \{1, 2, 3\}$. Define a relation R on A as :

$aRb \Leftrightarrow |a^2 - b^2| \leq 5$.

Then which of the following is not true ?

(1) $R^{-1} = R$, where R^{-1} is the inverse of R.

(2) Range of R is A.

(3) R is reflexive and symmetric.

(4) R is symmetric and transitive.

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2. 4 marks

The locus of the point $z = x + iy$ $(x, y \in \mathbf{R}, i = \sqrt{-1})$ satisfying $\arg\left(\frac{z-3}{z+3}\right) = \frac{\pi}{3}$, is :

(1) a circle with radius $= 2\sqrt{3}$

(2) a circle with centre at $(\sqrt{3}, 0)$

(3) a circle with centre at $(0, 2\sqrt{3})$ and radius 3

(4) an ellipse with length of its minor axis $= 3$

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3. 4 marks

If both the roots of the equation, $x^2-2ax+a^2-1=0\,(a\in \mathbf{R})$ lie in the interval $(-2, 2)$, then the equation, $x^2-(a^2+1)x-(a^2+2)=0$ has

(1) both roots in $(-3, 0)$

(2) one root in $(0, 2)$ and another root in $(-2, 0)$

(3) one root in $[2, 3)$ and another root in $(-2, 0)$

(4) one root in $(-3, -2)$ and another root in $(0, 2]$

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4. 4 marks

If the system of equations

$$2x+y+pz=-1$$
$$3x-2y+z=q$$
$$5x-8y+9z=5$$

has more than one solution, then $q-p$ is equal to :

(1) 2

(2) -2

(3) 4

(4) -4

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5. 4 marks

All the words (with or without meaning) formed using all the five letters of the word GOING are arranged as in dictionary. Then the word OGGIN occurs at the place which is :

(1) $(48)^{th}$

(2) $(49)^{th}$

(3) $(50)^{th}$

(4) $(51)^{th}$

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6. 4 marks

The sum

$$-\frac{2}{3}+\frac{2}{9^2}+\frac{10}{9^3}+\frac{18}{9^4}+\frac{26}{9^5}+\ldots\ldots\text{upto}$$

infinity, is equal to :

(1) $-\frac{5}{8}$

(2) $\frac{17}{24}$

(3) $-\frac{11}{24}$

(4) $\frac{5}{8}$

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7. 4 marks

Let r and s be respectively the remainders when $(12)^{23}$ and $(23)^{12}$ are divided by 5, then r + s is equal to :

(1) 5

(2) 4

(3) 3

(4) 2

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8. 4 marks

Let f be a differentiable function satisfying $f(x+y)=f(x)+f(y)-xy$ for all $x, y \in \mathbf{R}$. If $\lim\limits_{h\to 0}\frac{f(h)}{h}=3$, then $\sum\limits_{n=1}^{10} f(n)$ is equal to :

(1) $-\frac{55}{2}$

(2) $\frac{275}{2}$

(3) $-\frac{55}{4}$

(4) $\frac{225}{4}$

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9. 4 marks

For non-zero real numbers a, b, if $y(x) = \frac{a + b x^{3/2}}{x^{5/4}}$, $x > 0$ and $y''(5) = 0$, then the ratio a : b is :

(1) $\sqrt{5} : 3$

(2) $3 : \sqrt{5}$

(3) $\sqrt{5} : \sqrt{3}$

(4) $3 : 1$

10. 4 marks

The function $f(x) = \sin 2x + 2\cos x$, $x \in \left(-\frac{3\pi}{4}, \frac{3\pi}{4}\right)$ has :

(1) no critical point.

(2) a point of local maxima and a point of local minima.

(3) a point of local maxima and a point of inflection.

(4) a point of local minima and a point of inflection.

11. 4 marks

The integral $\int \frac{\cos^5\theta}{\sin\theta(4 - 3\sin^2 2\theta)} d\theta$ is equal to :

(where C is a constant of integration)

(1) $\frac{1}{5}\log_e \left|\frac{\cos^5\theta}{\sin^5\theta + \cos^5\theta}\right| + C$

(2) $\frac{1}{24}\log_e \left(\frac{\sin^6\theta}{\sin^6\theta + \cos^6\theta}\right) + C$

(3) $\frac{1}{20}\log_e \left|\frac{\sin^5\theta}{\sin^5\theta + \cos^5\theta}\right| + C$

(4) $\frac{1}{6}\log_e \left(\frac{\cos^6\theta}{\sin^6\theta + \cos^6\theta}\right) + C$

12. 4 marks

The area (in sq. units) of the region bounded by the parabola $x = 2y^2$ and the line $x + y = 1$ is :

(1) $\frac{11}{12}$

(2) $\frac{13}{24}$

(3) $\frac{9}{8}$

(4) $\frac{5}{4}$

13. 4 marks

Let $y = y(x)$ be the solution of the differential equation $x \log_e x \frac{dy}{dx} + 2y = 2x\ (x > 1)$. If $\lim_{x \to 1+} y(x) = 1$, then $y(e^2)$ is equal to :

(1) $\frac{e^2 - 1}{2}$

(2) $\frac{e^2 + 1}{2}$

(3) $e^2 - 1$

(4) $e^2 + 1$

14. 4 marks

If (x_i, y_i), $i = 1, 2, 3$ are the vertices of an equilateral triangle such that $(x_1 + 3)^2 + (y_1 - 4)^2 = (x_2 + 3)^2 + (y_2 - 4)^2 = (x_3 + 3)^2 + (y_3 - 4)^2$, then the value of $\frac{y_1 + y_2 + y_3}{x_1 + x_2 + x_3}$ is :

(1) $\frac{4}{3}$

(2) $-\frac{4}{3}$

(3) $\frac{3}{4}$

(4) $-\frac{3}{4}$

15. 4 marks

If tangent at $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ to the circle $x^2+y^2=1$ is also a tangent to the circle $(x-a)^2+(y-b)^2=1$, then the ordered pair (a, b) can be :

(1) $\left(-2, \sqrt{2}\right)$

(2) $\left(-\sqrt{2}, 2\sqrt{2}\right)$

(3) $\left(2, -2\sqrt{2}\right)$

(4) $\left(-\sqrt{2}, \sqrt{2}\right)$

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16. 4 marks

The foci of a hyperbola coincide with the foci of the ellipse, $\frac{x^2}{16}+\frac{y^2}{9}=1$. If the eccentricity of the hyperbola is 4, then its equation is :

(1) $\frac{x^2}{7}-\frac{4y^2}{105}=\frac{1}{4}$

(2) $\frac{x^2}{7}-\frac{y^2}{105}=\frac{1}{16}$

(3) $\frac{x^2}{20}-\frac{y^2}{75}=\frac{1}{16}$

(4) $\frac{x^2}{5}-\frac{y^2}{75}=\frac{1}{16}$

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17. 4 marks

If the plane P : $2x-y+3z+5=0$ is rotated through 90° about its line of intersection with the plane $5x-4y-2z+1=0$, then the equation of the plane P in the new position is :

(1) $27x-24y-26z+13=0$

(2) $27x-24y-26z-13=0$

(3) $31x+2y-20z-13=0$

(4) $31x-25y+29z+13=0$

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18. 4 marks

The top of two poles, standing 4 m apart on a horizontal plane, are connected by a cable. If the angles of depression from the top of one pole to the bottom of another pole are 30° and 45°, then the minimum length (in m) of the cable is :

(1) $\sqrt{\frac{32\sqrt{3}-16}{3}}$

(2) $\sqrt{\frac{128-32\sqrt{3}}{3}}$

(3) $\sqrt{\frac{122-32\sqrt{3}}{3}}$

(4) $\sqrt{\frac{112-32\sqrt{3}}{3}}$

19. 4 marks

Let A, B and C be three events such that the probability of occurrence of exactly one of A and B is $\frac{1}{2}$, the probability of occurrence of exactly one of B and C is $\frac{3}{4}$ and the probability of occurrence of exactly one of C and A is $\frac{1}{4}$. If the probability of occurrence of all the three events simultaneously is $\frac{1}{16}$, then the probability that at least one of the three events will occur is :

(1) $\frac{7}{16}$

(2) $\frac{13}{16}$

(3) $\frac{7}{8}$

(4) $\frac{15}{16}$

20. 4 marks

Let

p : I have passed JEE (Main),

q : My JEE (Main) rank is 100, and

r : I will appear in JEE (Advanced)

be three statements with truth values T, F and T respectively. Then which one of the following has the truth value, F ?

(1) $(\sim p \vee \sim q) \wedge r$

(2) $(p \wedge \sim q) \vee (\sim r)$

(3) $(\sim p \vee q) \wedge (\sim r)$

(4) $(\sim p \wedge q) \vee r$

21. Numerical value · 4 marks

Let $B = \begin{bmatrix} 22 & -26 \\ -6 & 10 \end{bmatrix}$ be the matrix obtained by applying the elementary row operations $R_2 \to R_2 - R_1$, $R_1 \to 2R_1$ and $R_1 \to R_1 - 2R_2$ (in this order only) on a matrix A. Then the sum of all entries of A is _____.

22. Numerical value · 4 marks

For $b \in \mathbf{N}$, if the limit of the function

$$f(x) = \begin{cases} [5x - 4], & x < 4 \\ \dfrac{[x + b]}{2}, & x > 4 \end{cases}$$

when $x \to 4$, exists and [t] denotes the greatest integer $\leq t$, then b is equal to _____.

23. Numerical value · 4 marks

If $S = \{x \in [0, 4\pi] : \sin 2x - \cos x = 0\}$ and the sum of the elements of S is $k\pi$, then k is equal to _____.

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24. Numerical value · 4 marks

If the mean of the numbers $-7, -5, -2, x, 5$ is -1, then the variance of the numbers $x-3, 4x, x+3$ is _____.

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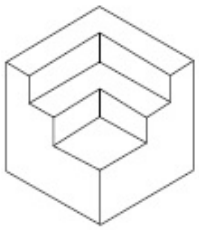
25. Numerical value · 4 marks

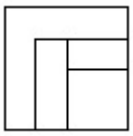
If the equation of a plane P passing through the point $\hat{i} + \hat{j} + \hat{k}$ is $\vec{r} \cdot \left(2\hat{i} - \hat{j} + a\hat{k}\right) = 3$, then the length of the perpendicular from the point $4\hat{i} - \hat{j} + 3\hat{k}$ on the plane P is _____.

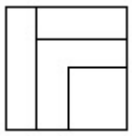
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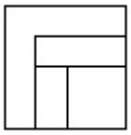
26. 4 marks

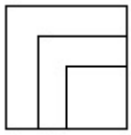
The 3 - D figure shows the view of an object. Identify the correct top view from amongst the answer figures.



(1) 

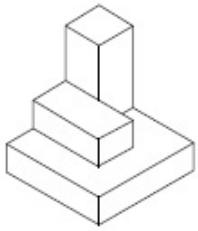
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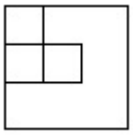
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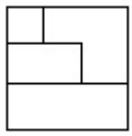
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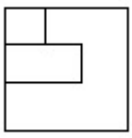
27. 4 marks

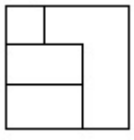
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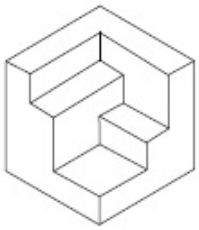
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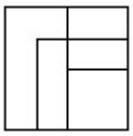
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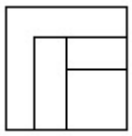
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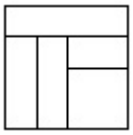
28. 4 marks

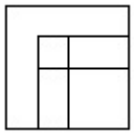
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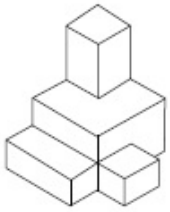
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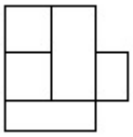
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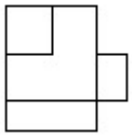
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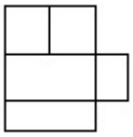
29. 4 marks

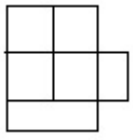
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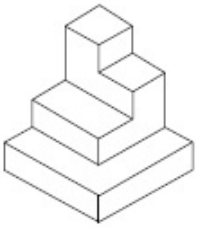
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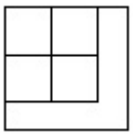
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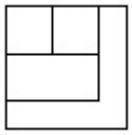
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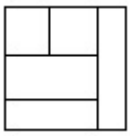
30. 4 marks

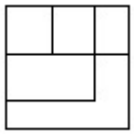
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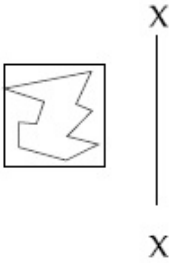
(3) 

(4) 

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31. 4 marks

Which one of the answer figures is the correct mirror image of the problem figure with respect to X – X ?



(1) 

(2) 

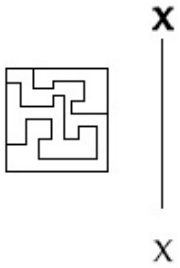
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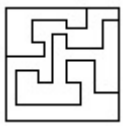
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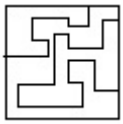
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32. 4 marks

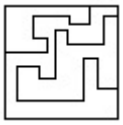
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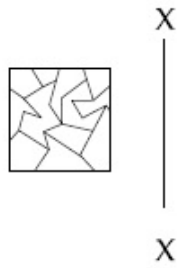
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33. 4 marks

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(1) 

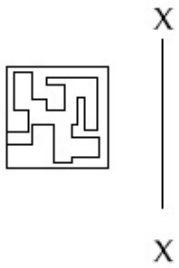
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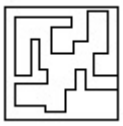
(3) 

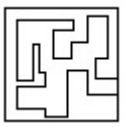
(4) 

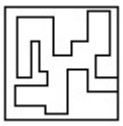
34. 4 marks

Which one of the answer figures is the correct mirror image of the problem figure with respect to X – X ?



(1) 

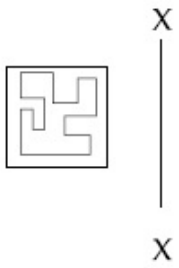
(2) 

(3) 

(4) 

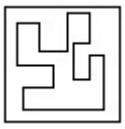
35. 4 marks

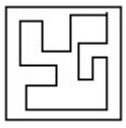
Which one of the answer figures is the correct mirror image of the problem figure with respect to X – X ?



(1) 

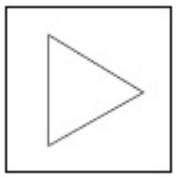
(2) 

(3) 

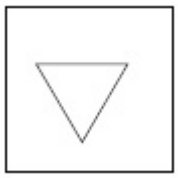
(4) 

36. 4 marks

Find the odd figure out of the problem figures given below.

(1) 

(2) 

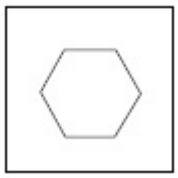
(3) 

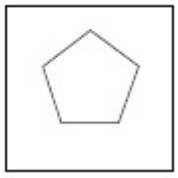
(4) 

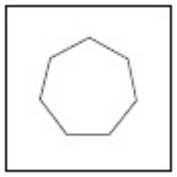
37. 4 marks

Find the odd figure out of the problem figures given below.

(1) 

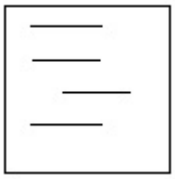
(2) 

(3) 

(4) 

38. 4 marks

Find the odd figure out of the problem figures given below.

(1) 

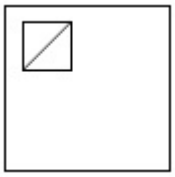
(2) 

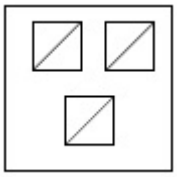
(3) 

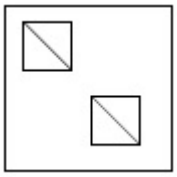
(4) 

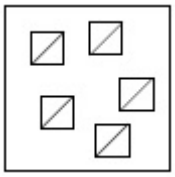
39. 4 marks

Find the odd figure out of the problem figures given below.

(1) 

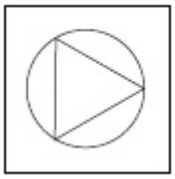
(2) 

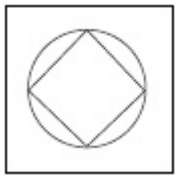
(3) 

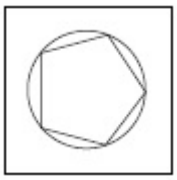
(4) 

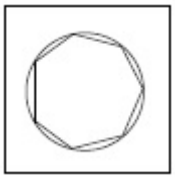
40. 4 marks

Find the odd figure out of the problem figures given below.

(1) 

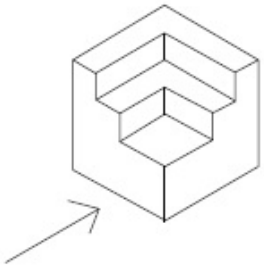
(2) 

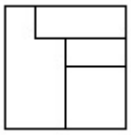
(3) 

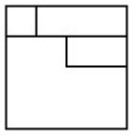
(4) 

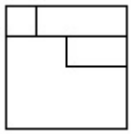
41. 4 marks

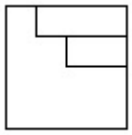
The 3 – D figure shows the view of an object. Identify the correct front view in the direction of the arrow, from amongst the answer figures.



(1) 

(2) 

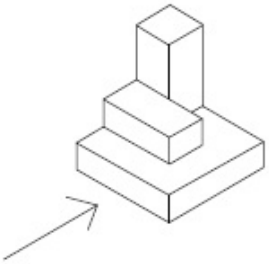
(3) 

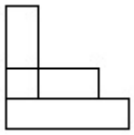
(4) 

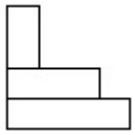
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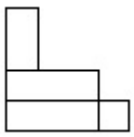
42. 4 marks

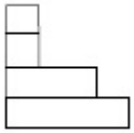
The 3 – D figure shows the view of an object. Identify the correct front view in the direction of the arrow, from amongst the answer figures.



(1) 

(2) 

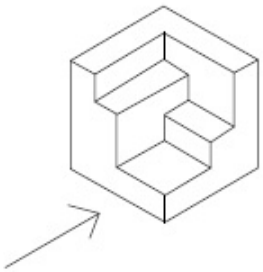
(3) 

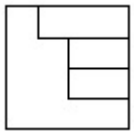
(4) 

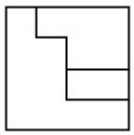
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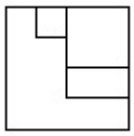
43. 4 marks

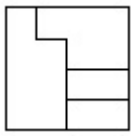
The 3 – D figure shows the view of an object. Identify the correct front view in the direction of the arrow, from amongst the answer figures.



(1) 

(2) 

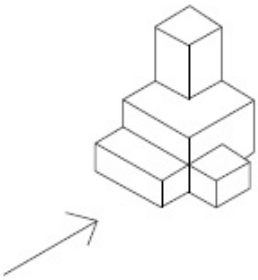
(3) 

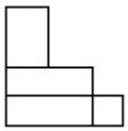
(4) 

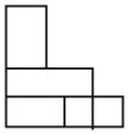
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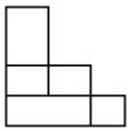
44. 4 marks

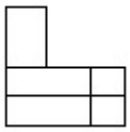
The 3 – D figure shows the view of an object. Identify the correct front view in the direction of the arrow, from amongst the answer figures.



(1) 

(2) 

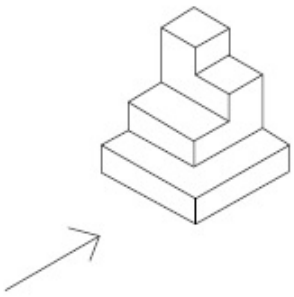
(3) 

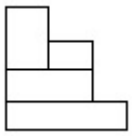
(4) 

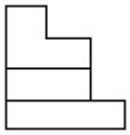
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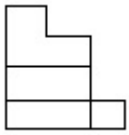
45. 4 marks

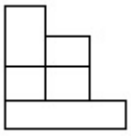
The 3 – D figure shows the view of an object. Identify the correct front view in the direction of the arrow, from amongst the answer figures.



(1) 

(2) 

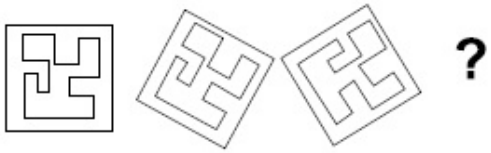
(3) 

(4) 

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46. 4 marks

Which one of the answer figure will complete the sequence of the three problem figures ?



(1) 

(2) 

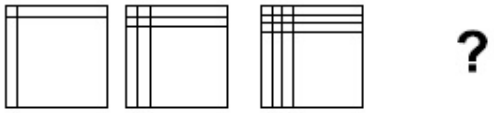
(3) 

(4) 

---

47. 4 marks

Which one of the answer figure will complete the sequence of the three problem figures ?



(1) 

(2) 

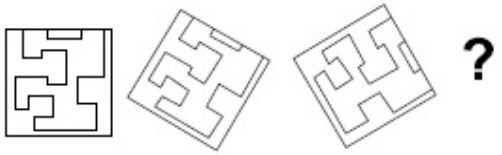
(3) 

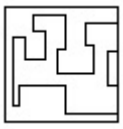
(4) 

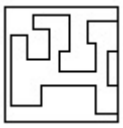
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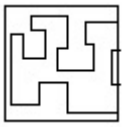
48. 4 marks

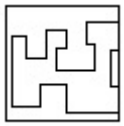
Which one of the answer figure will complete the sequence of the three problem figures ?



(1) 

(2) 

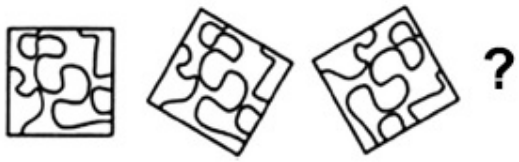
(3) 

(4) 

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49. 4 marks

Which one of the answer figure will complete the sequence of the three problem figures ?



(1) 

(2) 

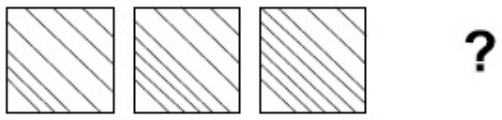
(3) 

(4) 

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50. 4 marks

Which one of the answer figure will complete the sequence of the three problem figures ?



(1) 

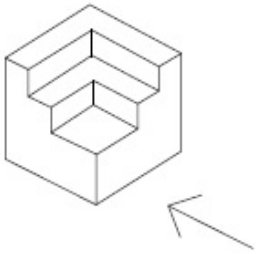
(2) 

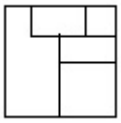
(3) 

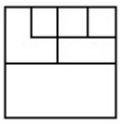
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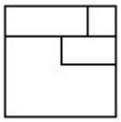
51. 4 marks

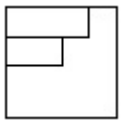
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(1) 

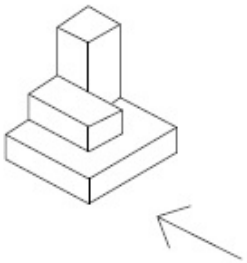
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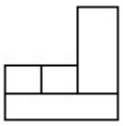
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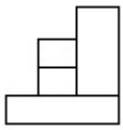
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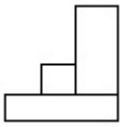
52. 4 marks

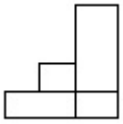
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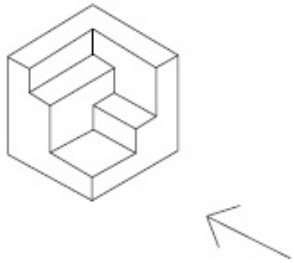
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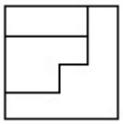
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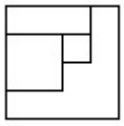
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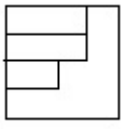
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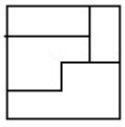
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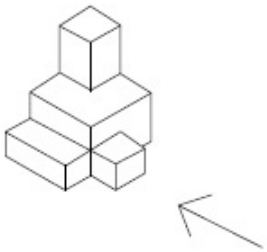
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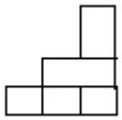
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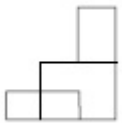
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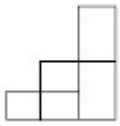
54. 4 marks

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(1) 

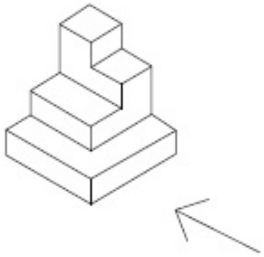
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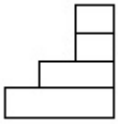
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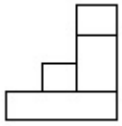
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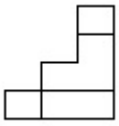
55. 4 marks

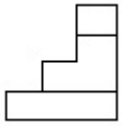
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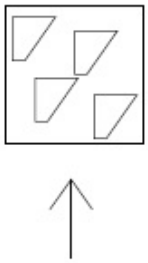
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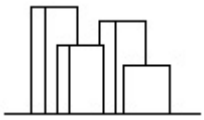
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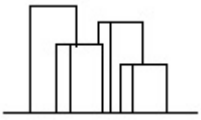
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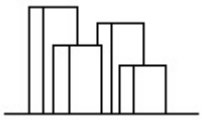
56. 4 marks

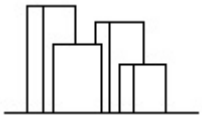
The problem figure shows the top view of objects. Looking in the direction of the arrow, identify the correct elevation, from amongst the answer figures.



(1) 

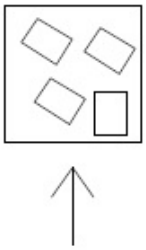
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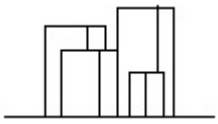
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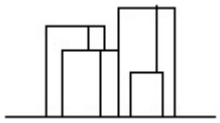
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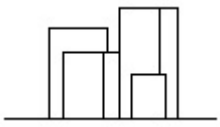
57. 4 marks

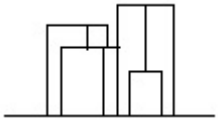
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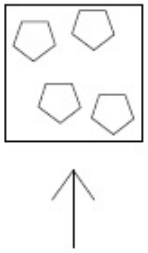
(2) 

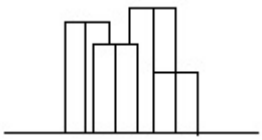
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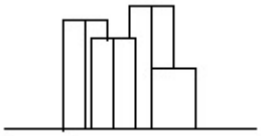
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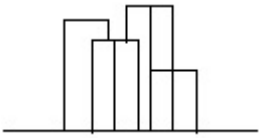
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(1) 

(2) 

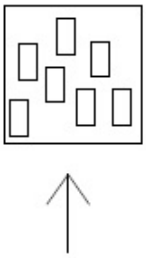
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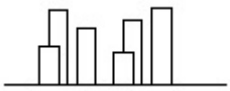
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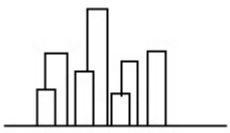
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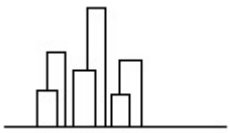
59. 4 marks

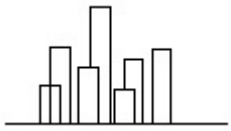
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(1) 

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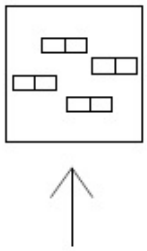
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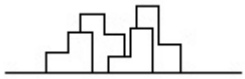
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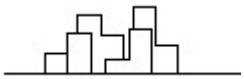
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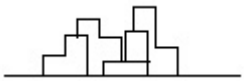
60. 4 marks

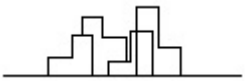
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(1) 

(2) 

(3) 

(4) 

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61. 4 marks

The White House is which one of the following ?

(1) Residence of Prime Minister of Germany

(2) Residence of Prime Minister of France

(3) Residence of Prime Minister of Spain

(4) Residence of President of USA

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62. 4 marks

In the Northern Hemisphere the summer sun rises from which one of the following directions ?

(1) North East

(2) North West

(3) South East

(4) South West

---

63. 4 marks

In which of the following States is the Golden Temple located ?

(1) Haryana

(2) Punjab

(3) Assam

(4) Nagaland

---

64. 4 marks

What is the thickness of a one and a half brick thick wall ?

(1) 9″ (2) 12″

(3) 18″ (4) 13.5″

65. 4 marks

Which one amongst the following supports the masonry above doors and windows ?

(1) Foundation (2) Lintel

(3) Slab (4) Wooden frame

66. 4 marks

The Leaning Tower in Italy is located in which one of the following cities ?

(1) Florence (2) Venice

(3) Pisa (4) Rome

67. 4 marks

Which one of the garden of the following is a terraced garden in Srinagar ?

(1) Nishat (2) Vrindaban

(3) Buddha (4) Nehru

68. 4 marks

What amongst the following is the name of the famous museum in Hyderabad ?

(1) Falaknuma (2) Salarjung

(3) Gandhi (4) Nizam

69. 4 marks

Which one of the color is made when blue and yellow are mixed ?

(1) Violet
(2) Orange
(3) Green
(4) White

70. 4 marks

Which one of the following color suggests love and romance ?

(1) Blue
(2) Green
(3) Pink
(4) Brown

71. 4 marks

Which one of the following suggests the texture of the skin of the elderly persons ?

(1) Glossy
(2) Wrinkled
(3) Smooth
(4) Soft

72. 4 marks

Which one of the following is fixed to drain water from a sloping roof ?

(1) Ridge
(2) Eave
(3) J. Bolt
(4) Gutter

73. 4 marks

Which one of the following is ideal flooring for a cinema hall ?

(1) Granite
(2) Brick
(3) Marble
(4) Carpet

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74. 4 marks

Who among the following is the architect of the Punjab Haryana High Court Building ?

(1) Maxwell Fry

(2) Le Corbusier

(3) Louis Kahn

(4) Geoffrey Bawa

75. 4 marks

Which one among the following is used for water conservation ?

(1) Water drainage

(2) Water evaporation

(3) Water harvesting

(4) Water flowing

Drawing

76. 50 marks

In the space provided for the answer of this question, draw an aesthetic composition appropriate to this space using triangles and rectangles. There is no restriction to numbers, sizes, placement and directions of these shapes. Color this composition so that it becomes visually exciting.

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77. 50 marks

Draw from imagination a gardener working in the garden.

OR

Draw from imagination a scene of a place for praying.

OR

Draw from memory your best friends face.

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