



Series ABDC2/4

Set No. 1



प्रश्न-पत्र कोड
Q.P. Code

65/4/1

अनुक्रमांक
Roll No.

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परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।

Candidates must write the Q.P. Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 7 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 14 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे।
- Please check that this question paper contains 7 printed pages.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 14 questions.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.



गणित
MATHEMATICS



निर्धारित समय : 2 घण्टे

Time allowed : 2 hours

अधिकतम अंक : 40

Maximum Marks : 40



General Instructions :

Read the following instructions very carefully and strictly follow them :

- (i) This question paper contains **three** sections – **Section A, B and C**.
- (ii) Each section is **compulsory**.
- (iii) **Section A** has **6** short answer type I questions of **2** marks each.
- (iv) **Section B** has **4** short answer type II questions of **3** marks each.
- (v) **Section C** has **4** long answer type questions of **4** marks each.
- (vi) There is an internal choice in some questions.
- (vii) Question no. **14** is a case-study based question with 2 sub-parts of **2** marks each.

SECTION A

Questions number **1** to **6** carry **2** marks each.

1. A bag contains 3 red and 4 white balls. Three balls are drawn at random, one-by-one without replacement from the bag. If the first ball drawn is red in colour, then find the probability that the remaining two balls drawn are also red in colour. 2
2. A coin is tossed twice. The following table shows the probability distribution of number of tails :

X	0	1	2
P(X)	K	6K	9K

- (a) Find the value of K.
 - (b) Is the coin tossed biased or unbiased ? Justify your answer. 2
3. The foot of a perpendicular drawn from the point $(-2, -1, -3)$ on a plane is $(1, -3, 3)$. Find the equation of the plane. 2
4. (a) If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 400$ and $|\vec{b}| = 5$, then find the value of $|\vec{a}|$. 2

OR

- (b) Find all the possible vectors of magnitude $5\sqrt{3}$ which are equally inclined to the coordinate axes. 2



5. Find the general solution of the differential equation

$$\sec^2 x \cdot \tan y \, dx + \sec^2 y \cdot \tan x \, dy = 0. \quad 2$$

6. Evaluate :

$$\int_0^1 x^2 e^x \, dx \quad 2$$

SECTION B

Questions number 7 to 10 carry 3 marks each.

7. Find the area of the region $\{(x, y) : x^2 \leq y \leq x + 2\}$, using integration. 3

8. (a) Find : 3

$$\int \frac{1}{e^x + 1} \, dx$$

OR

- (b) Evaluate : 3

$$\int_1^4 \{ |x| + |3 - x| \} \, dx$$

9. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitude, then prove that the vector $(2\vec{a} + \vec{b} + 2\vec{c})$ is equally inclined to both $\vec{a}$ and $\vec{c}$. Also, find the angle between $\vec{a}$ and $(2\vec{a} + \vec{b} + 2\vec{c})$. 3

10. (a) If a line makes 60° and 45° angles with the positive directions of x-axis and z-axis respectively, then find the angle that it makes with the positive direction of y-axis. Hence, write the direction cosines of the line. 3

OR

- (b) Check whether the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ are skew or not. 3



SECTION C

Questions number 11 to 14 carry 4 marks each.

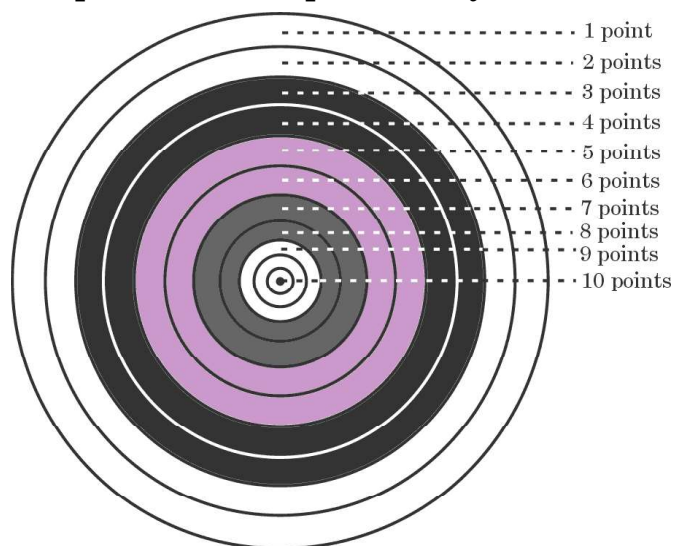
11. Find the equations of the planes passing through the line of intersection of the planes $\vec{r} \cdot (\hat{i} + 3\hat{j}) = 6$ and $\vec{r} \cdot (3\hat{i} - \hat{j} - 4\hat{k}) = 0$, which are at a distance of 1 unit from the origin. 4
12. (a) Find the particular solution of the differential equation $x \frac{dy}{dx} + y + \frac{1}{1+x^2} = 0$, given that $y(1) = 0$. 4

OR

- (b) Find the general solution of the differential equation $x(y^3 + x^3) dy = (2y^4 + 5x^3y) dx$. 4
13. Evaluate : 4
- $$\int_0^{\pi/2} (2 \log \cos x - \log \sin 2x) dx$$

Case-Study Based Question

14. In a game of Archery, each ring of the Archery target is valued. The centremost ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards. Archer A is likely to earn 10 points with a probability of 0.8 and Archer B is likely to earn 10 points with a probability of 0.9.



Based on the above information, answer the following questions :

If both of them hit the Archery target, then find the probability that

- (a) exactly one of them earns 10 points. 2
- (b) both of them earn 10 points. 2