

Sample Question Paper - 3
Mathematics (041)
Class- XII, Session: 2021-22
TERM II

Time Allowed: 2 hours

Maximum Marks: 40

General Instructions:

1. This question paper contains three sections – A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section – B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer-type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q 14 is a case-based problem having 2 sub-parts of 2 marks each.

Section A

1. Evaluate: $\int \frac{\cos x}{\sin^2 x + 4 \sin x + 5} dx$ [2]

OR

If $\int_0^a \sqrt{x} dx = 2a \int_0^{\pi/2} \sin^3 x dx$, find the value of integral $\int_a^{a+1} x dx$

2. Find the general solution of $(1 + x^2) dy + 2xy dx = \cot x dx (x \neq 0)$ [2]

3. If $\vec{a}, \vec{b}, \vec{c}$ are three mutually perpendicular unit vectors, then prove that $|\vec{a} + \vec{b} + \vec{c}| = \sqrt{3}$ [2]

4. Find the distance between the point P(6, 5, 9) and the plane determined by the points A (3, -1, 2), B (5, 2, 4) and C(-1, -1, 6). [2]

5. The probability that a bulb produced by a factory will fuse after 6 months of use is 0.05. Find the probability that out of 5 such bulbs at least one will fuse after 6 months of use. [2]

6. In a school there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in class XII given that the chosen student is a girl? [2]

Section B

7. Evaluate: $\int \frac{(3x+5)}{(x^3 - x^2 + x - 1)} dx$. [3]

8. It is given that the rate at which some bacteria multiply is proportional to the instantaneous number present. If the original number of bacteria doubles in two hours, in how many hours will it be five times? [3]

OR

Solve the differential equation: $\frac{dy}{dx} - y = xe^x$

9. If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}, \vec{a} \times \vec{b} = \vec{a} \times \vec{c}, \vec{a} \neq \vec{0}$, then show that $\vec{b} = \vec{c}$. [3]

10. Find the equation of line passing through points A (0,6,-9) and B(-3,-6,3). If D is the foot of perpendicular drawn from the point C (7,4,-1) on the line AB, then find the coordinates of point D and equation of line CD. [3]

OR

Find the vector equation of a plane which is at a distance of 7 units from the origin and normal to the vector $3\hat{i} + 5\hat{j} - 6\hat{k}$

Section C

11. Evaluate the integral: $\int \frac{|\cot x + \cot^3 x|}{1 + \cot^3 x} dx$ [4]
12. Find the area bounded by the circle $x^2 + y^2 = 16$ and the line $\sqrt{3}y = x$ in the first quadrant, using integration. [4]

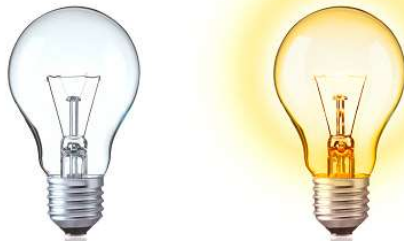
OR

Find the area of the region in the first quadrant enclosed by x -axis, line $x = \sqrt{3}y$ and the given curve $x^2 + y^2 = 4$

13. Find the equation of the plane through the points $(2, 1, -1)$ and $(-1, 3, 4)$, and perpendicular to the plane $x - 2y + 4z = 10$. [4]

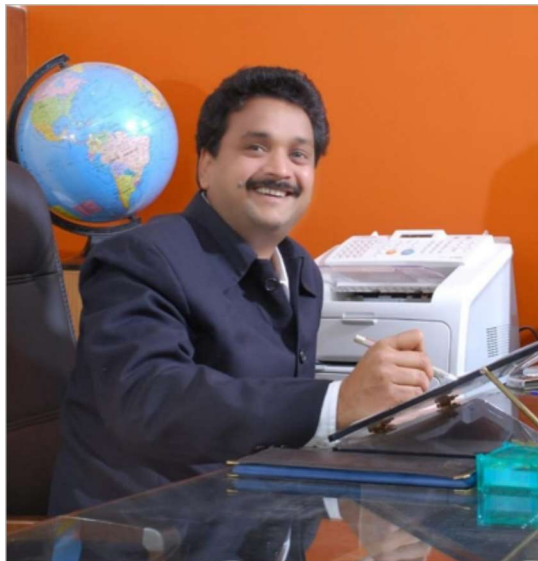
CASE-BASED/DATA-BASED

14. Elpis Limited is a company that produces electric bulbs. The quality of their bulbs is really very good. The customers are well satisfied and it has been as well recommended brand in the market. The probability that a bulb produced by Elpis Limited will fuse after 150 days of use is 0.05. [4]



Find the probability that out of 5 such bulbs

- No bulb will fuse after 150 days of use.
- Not more than one will fuse after 150 days of use.



Target
Mathematics
by Dr. Agyat
Gupta

