B2E Learning

Class-12

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Mock Test -1

Senior Secondary Examination, 2023

Mathematics

Time : 3 **Max. Marks : 80**

General Instructions to the Examinees:

(1) Candidate must write first his/her Roll No. on the question paper compulsorily.
(2) All the questions are compulsory.
(3) Write the answer to each question in thegiven answer book only.
(4) For question having more than one part the answers to those part are to be written together in continuity.
(5) Write down the serial number of the question before attempting it.

Section - A

1. $\int \sqrt{4-x^2}dx = ?$

(1) None of these

(2) $\frac{x}{2}\sqrt{4-x^2}+2\sin^{-1}\frac{x}{2}+C$

(3) $x\sqrt{4-x^2}+\sin^{-1}\frac{x}{2}+C$

(4) $\frac{1}{2}x\sqrt{4-x^2}-2\sin^{-1}\frac{x}{2}+C$

2. $\left[\hat{i}\ \hat{j}\ \hat{k}\right] = ?$

(1) 3 (2) 1
(3) 2 (4) 0

3. If P(A) $\frac{2}{5}$, P(B) = $\frac{3}{10}$ and P (A $\cap$ B) = $\frac{1}{5}$, then $P\left(\frac{A'}{B'}\right).P\left(\frac{B'}{A'}\right)$ is equal to

(1) $\frac{25}{42}$ (2) $\frac{5}{6}$
(3) $\frac{5}{7}$ (4) 1

4. The angle between two lines having direction ratios 1, 2, 2 and $\left(\sqrt{3}-1\right),\left(-\sqrt{3}-1\right),4$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$
(3) $\frac{\pi}{6}$ (4) $\frac{\pi}{2}$

5. Two numbers are selected and random from integers 1 through 9. If the sum is even, what is the probability that both numbers are odd ?

(1) $\frac{5}{8}$ (2) $\frac{1}{6}$

(3) $\frac{4}{9}$ (4) $\frac{2}{3}$

6. $\int e^x \left(\frac{1-x}{1+x^2}\right)^2$ is equal to

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

(3) $\frac{-e^x}{(1+x^2)^2}+C$ (4) $(\frac{e^x}{(1+x^2)^2}+C$

7. The direction ratios of two lines are 3, 2, –6 and respectively. The acute angle between these lines is

(1) $\cos^{-1}\left(\frac{5}{18}\right)$ (2) $\cos^{-1}\left(\frac{8}{21}\right)$

(3) $\cos^{-1}\left(\frac{5}{21}\right)$ (4) $\cos^{-1}\left(\frac{3}{20}\right)$

8. The area of the region bounded by the ellipse $\frac{x^2}{25}+\frac{y^2}{16}$ = 1 is

(1) $20\pi^2$ sq. units

(2) 25π sq. units

(3) 20π sq. units

(4) $16\pi^2$ sq. units

9. If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle θ, then the value of $|\vec{a}-\vec{b}|$ is

(1) $2\cos\frac{\theta}{2}$ (2) $2\sin\frac{\theta}{2}$

(3) 2cos (4) $2\sin\theta$

10. The area enclosed by the circle $x^2 + y^2 = 2$ is equal to

(1) $4\pi^2$ sq. units (2) 4π sq. units

(3) 2π sq. units (4) $2\sqrt{2}\,\pi$ sq. units

11. The degree of the diffeential equation $\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}=\frac{d^2y}{dx^2}$ is

(1) 2 (2) $\frac{3}{2}$

(3) not defined (4) 4

12. $\int \sin^3(2x + 1)\,dx$ = ?

(1) $\frac{1}{2}\cos(2x + 1) + \frac{1}{3}\cos^3(2x + 1) + C$

(2) $-\frac{1}{2}\cos(2x + 1) + \frac{1}{6}\cos^3(2x + 1) + C$

(3) $\frac{1}{8}\sin^4(2x + 1) + C$

(4) None of these

13. If $\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$ and A + A' = 1, If the value of α is

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$

(3) $\frac{3\pi}{2}$ (4) π

14. Function $f(x) = 2x^3 – 9x^2 + 12x + 29$ is monotonically decreasing when

(1) x > 2 (2) 1 < x < 2

(3) x < 2 (4) x > 3

15. Let A be a non-singular square matix of oder 3 × 3. Then |adj A| is equal to

(1) |A| (2) 3|A|

(3) |A|3 (4) $|A|^2$

16. If A is a 3 × 3 matarix such that |A| = 8, then |3A| equals.

(1) 8 (2) 72

(3) 216 (4) 24

17. What is the equation of a curve passing through (0, 1) and whose differential equation is given by dy = y tan x dx ?

(1) y = sec x (2) y = sin x

(3) y = cosec x (4) y = cos x

18. Domain of $\cos^{-1}x$ is

(1) [–1, 0] (2) [0, 1]

(3) None of these (4) [–1, 1]

19. **Assertion (A) :** If manufacturer can sell x items at a price of Rs. $\left(5-\frac{x}{100}\right)$ each. The cost price of x items is Rs. $\left(\frac{x}{5}+100\right)$. Then, the number of items he should sell to earn maximum profit is 240 items.

Reason (R) : The profit for selling x items is given by $\frac{24}{5}x-\frac{x^2}{100}-300$.

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R aer 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.

20. **Assertion (A) :** The matrix A = $\begin{bmatrix}1 & 2\\ 4 & 8\end{bmatrix}$ is singular.

Reason (R) : A square matrix A is said to be singular, if |A| – 0.

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R aer 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.

Section - B

21. Write the cofactor a_{12} in the matrix $\begin{bmatrix}2 & -3 & 5\\ 6 & 0 & 4\\ 1 & 5 & -7\end{bmatrix}$

or

Solve the system of equations by matrix method

8x + 4y + 3z = 18

2x + y + z = 5

x + 2y + z = 5

22. Find the value of

$$\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)+\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)+\tan^{-1}\left[\sin\left(\frac{-\pi}{2}\right)\right]$$

23. Verify that $y = (a + bx)e^{2x}$ is the general solution of the differential equation $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+4y=0$

24. Given the probability that A can solve a problem is 2/3, and the probability that B can solve the same problem is 3/5, find the probability that at least one of A and B will solve the problem.

25. For what value of λ are the vectors $\vec{a}$ and $\vec{b}$ perpendicular to each othe? where;

$\vec{a}=\lambda\hat{i}+2\hat{j}+\hat{k}$ and $\vec{b}=4\hat{i}-9\hat{j}+2\hat{k}$

Section - C

26. Find the particular solution of the diffeential equations

$e^x\sqrt{1-y^2}dx+\frac{y}{x}dy=0$, given that y = 1, when x = 0.

OR

Solve the initial value problem :

$(x^2 + 1)y' – 2xy = (x^4 + 2x^2 + 1)\cos x$, y (0) = 0

27. Pove $\int_0^{\frac{x}{4}}2\tan^3 x dx$ = 1 – log2

28. Evaluate : $\int\frac{x^2}{(x^4-x^2-12)}dx$

OR

Evaluate : $\int\sin^{-1}\sqrt{\frac{x}{a+x}}dx$

29. Show that the point A (1, 2, 7) , B(2, 6, 3) and C(3, 10, –1) are collinear.

OR

Prove using vectors; The quadrilateral obtained by joining midpoint of adjacent side of a rectangle is a rhombus.

30. If $x = a(1 – \cos^3\theta)$, $y = a\sin^3\theta$, prove that $\frac{d^2y}{dx^2}=\frac{32}{27a}$ at $\theta=\frac{\pi}{6}$.

31. Sketch the region bounded by the curve $y = 2x - x^2$ and the x-axis and find it's area.

Section - D

32. Minimize $Z = x + 2y$ subject to $2x + y \geq 3$, $x + 2y \geq 6$, $x, y \geq 0$. Show that the minimum of Z occurs at more than two points.

33. Show that the function $f: R_0 \to R_0$, defined as $f(x) = \frac{1}{x}$, is one-one, where R_0 is the set non-zero real number. Is the result true, if the domain R_0 is replaced by N with co-domain being same as R_0?

OR

Show that the function $f: R \to R$ defined by $f(x) \frac{x}{x^2+1}, \forall x \in R$, is neither one-one nor onto.

34. Find the vector equation of the line passing through (1, 2, 3) and parallel to of the planes $\vec{r}.\left(\hat{i}-\hat{j}+2\hat{k}\right)=5$ and $\vec{r}.\left(3\hat{i}+\hat{j}+\hat{k}\right)=6$. Also find the point of intersection of the line thus obtained with the plane $\vec{r}.\left(2\hat{i}+\hat{j}+\hat{k}\right)=4$

OR

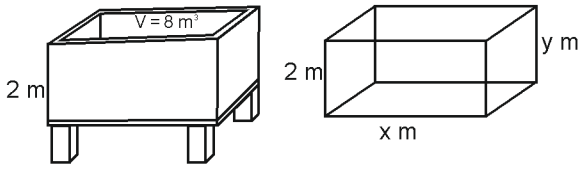
Show that the line $\vec{r}=\left(\hat{i}+2\hat{j}+3\hat{k}\right)+\lambda\left(2\hat{i}+3\hat{j}+4\hat{k}\right)$ and $\vec{r}=\left(4\hat{i}+\hat{j}\right)+\mu\left(5\hat{i}+2\hat{j}+\hat{k}\right)$ intesect. Also, find their point intersection.

35. Find $\frac{dy}{dx}$ of the function $x^y + y^x = 1$

Section - E

36. **Read the text carefully and aswer the questions:**

One the request of villagers, a construction agency designs a tank with the help of an architect. Tank consist of a ractangular base with rectangular side, open at the top so that its depth is 2 m and volume i $8m^3$ as shown below. The construction of the tank cost Rs. 70 per sq. meter for the base and Rs.45 per squae mete for sides.



(i) Express making cost C in terms of length of rectangle base.

(ii) If x and y represent the length and breadth of its rectangular base, then find the relation between the variables.

(iii) Find the value of x of that the cost of construction is minimum.

OR

Varify by second derivative test that cost is minimum at a critical point.

37. **Read the text carefully and answer the questions:**

Three car dealers, say A, B and C deals in three types of cars, namely Hatchback cars, Sedan car, SUV cars. The sales figure of 2019 and 2020 showed that dealer A sold 120 Hatchback, 50 Sedan, 10 SUV cars in 2019 and 300 Hatchback, 150 Sedan, 20 SUV cars in 2020; dealer B sold 100 Hatchback, 30 Sedan, 5 SUV cars in 2019 and 200 Hatchback, 50 Sdan, 6 SUV cars in 2020; dealer C sold 90 Hatchbalck, 40 Sedan, 2 SUV cars in 2019 and 100 Hatchback, 60 Sedan, 5 SUV cars in 2020.

(i) Write the matrix summarizing sales data of 2019 and 2020.

(ii) Find the matrix summarizing sales data of 2020.

(iii) Find the total numbers of cars sold in two given years, by each dealer?

OR

If each dealer receives a profit of Rs. 50000 on sale of a Hatchback, Rs. 100000 on sale of a Sedan and Rs. 200000 on sale of an SUV, then find teh amount of profit received in the year 2020 by each dealer.

38. **Read the text carefully and answer the questions:**

To teach the application of probability a maths teacher arranged a surprise game for 5 of his students namely Govind, Girish, Vinod, abhishek and Ankit. He took a bowl containing tickets numbered 1 to 50

and told the students go one by one and draw two tickets simultaneously from the bowl and replace it after noting the numbers.

(i) Teacher as Govind, what is the probability that tickets are drawn by Abhishek, shows a prime number on one ticket and a multiple of 4 on other ticket?

(ii) Teacher ask Girish, what is the probability that tickets drawn by Ankit, shows an even number on first ticket and an odd number on second ticket?