CBSE Sample Paper-2015
Class-XII Subject - Mathematics (041)

Time Allowed : 3 Hours M.M. : 100

General Instructions:

(i) All questions are Compulsory.
(ii) The question paper consists of 29 questions divided into three section A, B and C. Section A comprises of 10 questions of one mark each, section B Comprises of 12 questions of four marks each and section C comprises of 07 questions of six marks each.
(iii) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.
(iv) There is no overall choice, However, internal choice has been provided in 04 question of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
(v) Use of calculators is not permitted. You may ask for logarithmic tables, if required.

Section-A

Q.1. Find the principal value of, $\cot^{-1}\left[\tan\frac{3\pi}{4}\right]$

Q.2. Evaluate : $\tan^{-1}\left\{\cot\left[-\frac{3\pi}{4}\right]\right\}$

Q.3. Write the value of x + y + z, if $\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}1\\-1\\0\end{bmatrix}$.

Q.4. If A is a square matrix of order 3 such that |adj A| = 225, find |A'|

Q.5. Write the inverse of the matrix $\begin{bmatrix}\cos\theta&\sin\theta\\-\sin\theta&\cos\theta\end{bmatrix}$

Q.6. The contentment obtained after eating x-units of a new dish at a trial function is given by the function C(x)=x3+6x+3. If the marginal contentment is defined as rate of change

of C (x\) with respect to the number of units consumed at an instant, then the marginal contentment when three units of dish are consumed.

Q.7. Write the degree to the differential equation: $\left[\frac{d^2y}{dx^2}\right]^2 - 2\frac{d^2y}{dx^2} - \frac{dy}{dx} + 1 = 0$

Q.8. If $\vec{a}$ and $\vec{b}$ are two vectors of magnitude 3 and 2/3 respectively such that $\vec{a} \times \vec{b}$ is a unit vector, write the angle between $\vec{a}$ and $\vec{b}$.

Q.10. Write the distance between the parallel planes 2x-y+3z=4 and 2x-y+3z=18.

Section-B

Q.11. Prove that the function $f : N \to N$, defined by $f(x) = x^2+x+1$ is one - one but not onto.

Q.12. Show that : $\sin[\cot^{-1}\{\cos(\tan^{-1})\}] = \sqrt{\frac{x^2+1}{x^2+2}}$

Or

Solve for x : $3\sin^{-1}\left[\frac{2}{1+x^2}\right] - 4\cos^{-1}\left[\frac{1-x^2}{1+x^2}\right] + 2\tan^{-1}\left[\frac{2x}{1-x^2}\right] = \frac{\pi}{3}$

Q.13. Two schools A and B decided to award prizes to their students for three values honesty (x) punctuality (y) and obedience (z). School A decided to award a total of Rs. 11,000 for the value to 5, 4 and 3 students respectively, while school B decided to award Rs. 10,700 for the three value to 4, 3 and 5 students respectively. If all the three prizes together amount to Rs. 2,700, then

(i) represent the above situation by a matrix equation and form linear equations using matrix multiplication

(ii) is it possible to solve the system of equations so obtained using matrices?

(iii) which value you prefer to be rewarded most and why?

Q.14. If $x = a(\theta - \sin\theta)$ and $y = a(1-\cos\theta)$, find y" .

Q.15. If $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$, show that $(1-x2)\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} - y = 0$.

Q.16. The function $f(x)$ is defined as $f(x) = \begin{cases} x^2 + ax + b, & o \le x < 2 \\ 3x + 2, & 2 \le x < 2 \\ 2ax + 5b, & 4 < x \le 8 \end{cases}$

If (x) is continuous in [0,8], find the values of a and b.

Or

Differentiate : $\tan^{-1}\left[\frac{\sqrt{1+x^2} - \sqrt{1-x^2}}{\sqrt{1+x^2} + \sqrt{1-x^2}}\right]$ with respect to $\cos^{-1}(x^2)$.

Q.17. Evaluate : $\int \frac{x^2 + x + 1}{x^2 - 1}$ dx.

Or

Evaluate: $\int e^{\frac{(1 - \sin x)}{(1 - \cos x)}}$ dx.

Q.18. Evaluate : $\int \frac{2x}{(x^2+1)(x^2+2)}$ dx.

Q.19. Evaluate : $\int_0^{\pi/4} \log (1+\tan x)$ dx, using properties of definite integrals.

Q.20. Let $\vec{a}$ = 4î + 5ĵ - ќ, $\vec{b}$ = i -4 j + k and $\vec{c}$ = 3i +j + - k, find a vector $\vec{d}$ which is perpendicular to both a and b and satisfying $\vec{d}.\vec{c}$ = 21

Q.21. Find the distance between the point P (6, 5, 9) and the plane determined by the points A (3, -1, 2), B (54, 2, 4) and C (-1, -1, 6).

OR

Find the equation of the perpendicular drawn from the point P(2, 4, -1) to the line

$\frac{x+5}{1} = \frac{y+3}{4} = \frac{z+6}{-9}$. Also, write down the coordinates of the foot of the perpendicular from P to the line.

Q.22. There is a group of 50 people who are patriotic out of which 20 believer in non violence. Two persons are selected at random out of them, write the probability for the selected persons who are no violent. Also find the mean of the distribution. Explain the importance of non violence in patriotism. **SECTION-C**

Q.23. Find the equations of tangent and normal to the curve, y = $\frac{x - 7}{(x-2)(x-3)}$ at the point where it cuts the x-axis.

Or

Prove that the radius of he base of right circular cylinder of greatest curved surface area which can be inscribed in a given cone is half that of the cone.

Q.24. Find the area of the region enclosed between the two circles $x^2 + y^2 = 1$ and $(x-1)^2 + y^2 = 1$.

Q.25. Find the particular solution of the differential equations: (x - sin y) dy + (tan y) dx = 0; given that y =0 when x= 0

Q.26. Find the vector and Cartesian equations of the plane containing the two lines $\vec{r}$ = 2î ĵ - 3 k + λ (i+2j+k) and $\vec{r}$ = 3i +3j +2k + μ (3i - 2j + 5k).

Q.27. A dealer in rural area wishes to purchase a number of sewing machines. He has only Rs. 57600.00 to invest and has space for at most 20 items. A electronic sewing machine costs him Rs. 360.00 and a manually operated sewing machine Rs. 240.00. He can sell an electronic sewing machine at a profit of Rs. 22.00 and a can buy how should he

invest his money in order to maximize his profit? Make it as a linear programming problem and solve it graphically, Keeping the rural background in mind justify the 'values' to promoted for the selection of the manually operated machine.

Q.28. In answering a question on a MCQ test with 4 choices per question, a student knows the answer, guesses or copies the answer. Let 1/2 be the probability that he knows the answer, 1/4 be the probability that he guesses and 1/4 that he copies it. Assuming that a student, who copies the answer, will be correct with the probability 3/4, what is the probability that the student knows the answer, given that he answered it correctly.
Arjun does not know the answer to one of the questions in the test. The evaluation process has negative marking. Which value would Arjun violate if he resorts to unfair means? How would an act like the above hamper his character development in the coming years?

OR

An insurance company insured 2000 cyclists, 4000 scooter drivers and 6000 motorbike drivers. The probability of an accident involving a cyclist, scooter, driver and a motorbike are 0.01, 0.03 that he is a scooter driver? When mode of transport would you suggest to a student and why?

Q.29. Solve the following System of Equations-
x+2y-3z=-4,2x+3y+2z=2,3x-3y-4z=11.

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