Ramakrishna Mission Residential College(Autonomous)

Narendrapur, Kolkata-700103

Sample Question for Admission Test 2016

Subject: Mathematics

Objective Questions

1. The value of $\begin{vmatrix} {}^2c_0 & {}^3c_1 & {}^4c_2 \\ {}^3c_1 & {}^4c_2 & {}^5c_3 \\ {}^4c_2 & {}^5c_3 & {}^6c_4 \end{vmatrix}$ is _____ .
2. The simplified value of $8\cos 20^\circ \cos 40^\circ \cos 80^\circ$ is _____ .
3. An urn contains 3 white and 5 black balls. One ball is drawn and kept aside. Then another ball is drawn. The probability that 'the second ball drawn is white' is _____ .
4. Domain of the function $f(x) = \log_{3+x}(x^2 - 1)$ is _____ .
5. The locus of the point of intersection of the straight lines $\sqrt{3}\,x - y - 4\sqrt{3}\,k = 0$ and $\sqrt{3}\,kx + ky - 4\sqrt{3} = 0$ (where k is a parameter) is a hyperbola , whose eccentricity is _____ .
6. Let ρ be a relation defined on the set $\mathbb{N}$ of natural numbers such that $\rho = \{(x, y) \in \mathbb{N} \times \mathbb{N} : 2x + y = 41\}$.
   Then domain of ρ = _____ .
   and range of ρ = _____ .
7. The sum of $12 + 105 + 1008 + 10011 + \cdots\cdots$ upto n terms is _____ .

Group- B(Subjective)

8. By mathematical induction, prove that if $A = \begin{pmatrix} 11 & -25 \\ 4 & -9 \end{pmatrix}$ then $A^n = \begin{pmatrix} 1+10n & -25n \\ 4n & 1-10n \end{pmatrix}$, where n is a +ve integer.
9. Use elementary row operations to check whether the matrix $A = \begin{pmatrix} 0 & 2 & 4 \\ 2 & 4 & 2 \\ 3 & 3 & 1 \end{pmatrix}$ is invertible and if possible, find its inverse simultaneously.
10. Calculate the standard deviation of the following data:

Class interval	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	3	6	12	16	8	5

11. Find the shortest distance and the equation of the line of shortest distance between the lines $\vec{r} = 3i - 15j + 9k + t(2i - 7j + 5k)$ and $\vec{r} = (2t - 1)i + (1 + t)j + (9 - 3t)k$.
12. Find the equation of the image of the line $\frac{x-1}{3} = \frac{y-3}{5} = \frac{z-4}{2}$ with respect to the plane $2x - y + z + 3 = 0$.
13. Solve the following L.P.P. graphically:
    Minimize $Z = -x - y$
    subject to $5x + 9y \le 45$,
    $2x + y \ge 2$,
    $y \le 4$,
    $x \ge 0,\ y \ge 0$.
14. Obtain the differential equation of the family of circles, the centres of which are on the line $y = x$.

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