

16-01-2013. XII IInd pre-board. Exam

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SECOND COMMON PREBOARD EXAMINATION 2012-13

MATHEMATICS

CLASS XII

TIME: 3hrs

MM:100

General Instructions

1. All questions are compulsory.
2. The question paper consist of 29 questions divided into three sections 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 7 questions of six marks each.
3. All questions in Section A are to be answered in one word, one sentence or a s per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such quest ions.
5. Use of calculators in not permitted. You may ask for logarithmic tables, if required.

SECTION - A

(1) Evaluate $\cot[\sec^{-1}x + \sin^{-1}(1/x)]$

(2) Write the principal value of $[\cos]^{-1}(-1) [(\cos 7\pi/6)]$.

(3) Find x+y from the following equation

$$2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

(4) For what value of x is the matrix $\begin{bmatrix} 2x+4 & 4 \\ x+5 & 3 \end{bmatrix}$ singular.

(5) Find the value of k if $A^2 = 8A + kI$ where $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$

(6) Find the derivative of 7^x with respect to x

(7) Write the degree of the differential equation $\sqrt{x + \left(\frac{dy}{dx}\right)^2} = \left[a \frac{d^2y}{dx^2} \right]^{1/3}$

(8) Find $|\vec{a} - \vec{b}|$, if two vectors \vec{a} and \vec{b} are such that $|\vec{a}|=2$ and $|\vec{b}|=3$ and $\vec{a} \cdot \vec{b} = 4$.

9) If $\vec{a} = \hat{i} + \hat{j}$; $\vec{b} = \hat{j} + \hat{k}$; $\vec{c} = \hat{k} + \hat{i}$ find a unit vector in the direction of $\vec{a} + \vec{b} + \vec{c}$

10) Find the angle between the line $\frac{x-2}{3} = \frac{y+1}{-1} = \frac{z-3}{2}$ and the plane

$$3x + 4y + z + 5 = 0$$

SECTION - B

(11) A family has 2 children. Find the probability that both are boys if it is known that

(a) Elder one is a boy?

(b) So you think that every family should have a minimum a girl child and a boy child.

Give your suggestion?

(12) Solve for x : $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\frac{8}{31}, x > 0$

OR

Solve for x : $\tan^{-1}\left[\frac{1-x}{1+x}\right] = \frac{1}{2}\tan^{-1}x, x > 0$

(13) Let $A = N \times N$ and $*$ be the binary operation on A defined by $(a,b)*(c,d) = (a+c, b+d)$. Show that $*$ is commutative and associative. Find the identity element for $*$ on A if any

(14) If $y = a \cos \log x + b \sin \log x$ show that $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$

(15) If $x^y = e^{x-y}$ show that $\frac{dy}{dx} = \frac{\log x}{\log(xe)^2}$

OR

If $\sin y = x \sin(a+y)$. Prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin y}$

(16) The function $f(x)$ is defined as $f(x) = \begin{cases} x^2 + ax + b, & 0 \leq x < 2 \\ 3x + 2, & 2 \leq x \leq 4 \\ 2ax + 5b, & 4 < x \leq 8 \end{cases}$

If $f(x)$ is continuous on $[0,8]$, find the values of a and b

(17) If $\vec{a}, \vec{b}, \vec{c}$ are 3 vectors of magnitudes 3, 4, 5 respectively such that each one is perpendicular to the sum of the other 2 vectors. Prove that $|\vec{a} + \vec{b} + \vec{c}| = 5\sqrt{2}$

(18) Evaluate $\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$

(19) Using properties of determinant, prove that

