Grand Test	HSC Examination Maths Code - Set - A	Marks : 80 Time : 3 Hours

Instructions :

1. All the questions are compulsory.
2. The Question paper consist of 30 Questions divided into four section **A, B, C, D.**
3. Section A contains 6 Questions of 1 mark each.
   Section B contains 8 Questions of 2 marks each.
   Section C contains 6 Questions of 3 marks each.
   Section D contains 10 Questions of 4 marks each.
4. Use of logarithmic table is allowed.
5. Use of calculator is not allowed.
6. In LPP only rough sketch of graph is expected. Graph paper is not necessary.

SECTION - A

Q.1 Joint equation of pair of lines represented by equation $ax^2+2hxy+by^2=0$ are real and coincident if _______.

(A) $h^2-ab>0$ (B) $h^2-ab=0$ (C) $h^2-ab<0$ (D) None of these

Q.2 If the vectors $3\hat{i}-5\hat{j}+\hat{k}$ and $9\hat{i}-15\hat{j}+p\hat{k}$ are collinear then the value of p is _________.

(A) $p = 4$ (B) $p = -3$ (C) $p = 3$ (D) $p = 1$

Q.3 The direction ratio of the line passing through the point $A \equiv (-4, 2, 3)$ and $B \equiv (1, 3, -2)$ are ________.

(A) 1, 2, 3 (B) 5, 1, –5 (C) 6, 1, 5 (D) 5, –1, –5

Q.4 If $y=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ then $\frac{dy}{dx}=$ _________.

(A) $\frac{2}{1+x^2}$ (B) $\frac{-2}{1+x^2}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{1}{1-x^2}$

Q.5 $\int e^x(\sec x+\sec x\tan x)\,dx=$ ________.

(A) $e^x\tan x+C$ (B) $e^{-x}\sec x+C$ (C) $e^x\sec x+C$ (D) $e^{-x}\tan x+C$

Q.6 The order and degree of the differential equation $\left[1+\left(\frac{dy}{dx}\right)^3\right]^{\frac{7}{3}}=7\cdot\frac{d^2y}{dx^2}$ is _______

(A) 1, 21 (B) 1, –7 (C) 3, 2 (D) 2, 3

SECTION - B

Q.7 Prepare the truth table for $p \to (p \vee q)$.

Q.8 Find the general solution of $\cos x = \frac{-1}{2}$.

Q.9 Solve the triangle in which $a = 2,\ b = 1,\ c = \sqrt{3}$.

Q.10 Find the direction ratios of a vector perpendicular to the two lines whose direction ratios are –2, 1, –1 and –3, –4, 1.

Q.11 If $y = x^{e^x}$ then find $\frac{dy}{dx}$.

Q.12 Find the value of x, such that $f(x) = x^2 + 2x - 5$ is an increasing function.

Q.13 Evaluate $\int \frac{e^{x-1} + x^{e-1}}{e^x + x^e} dx$.

OR

Evaluate $\int \frac{\sec\theta}{\sec\theta + \tan\theta} d\theta$

Q.14 If $\int_0^a (2x+1) dx = 2$, find the real value of 'a'.

SECTION - C

Q.15 Find the joint equation of pair of lines through the origin, which are perpendicular to the lines represented by $5x^2 - 8xy + 3y^2 = 0$.

Q.16 Find the shortest distance between the lines $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ and $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$.

Q.17 Find the vector equation of the plane passing through the points $\hat{i} + \hat{j} - 2\hat{k},\ \hat{i} + 2\hat{j} + \hat{k},\ 2\hat{i} - \hat{j} + \hat{k}$.

OR

Prove that the lines $\frac{x-2}{1} = \frac{y-4}{4} = \frac{z-6}{7}$ and $\frac{x+1}{3} = \frac{y+3}{5} = \frac{z+5}{7}$ are coplanar. Also, find the equation of the plane containing these two lines.

Q.18 If $x^5 \cdot y^7 = (x+y)^{12}$ than show that $\frac{dy}{dx} = \frac{y}{x}$.

OR

Differentiate $\cos^{-1}(\sin x)$ w.r.t. $\tan^{-1} x$.

Q.19 Random variable x has the following probability distribution.

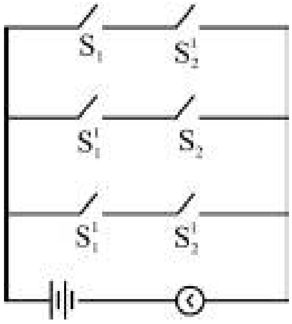
$x = x$	-2	-1	0	1	2	3
$p(x)$	0.1	k	0.2	$2k$	0.3	k

Find the value of k and calculate mean and variance of x.

Q.20 The probability of hitting a target in any short is 0.2. If 10 shots are fired, find the probability that the target will be at least twice.

SECTION - D

Q.21 Simplify the following so that the new circuit has minimum number of switches. Also draw the simplified circuit.



Q.22 The cost of 4 dozen pencils, 3 dozen pens and 2 dozen erasers is Rs. 60. The cost of 2 dozen pencils, 4 dozen pens and 6 dozen erasers is R. 90, whereas the cost of 6 dozen pencils, 2 dozen pens and 3 dozen erasers is Rs. 70. Find the cost of each item per dozen by using matrices.

OR

Solve the following equations by the method of inversion :

$x+y+z=-1,\ x-y+z=2$ and $x+y-z=3$.

Q.23 Prove that sides of a triangle are proportional to the sines of the opposite angles.

Q.24 If four points $A(\bar{a})$ $B(\bar{b})$ $C(\bar{c})$ and $D(\bar{d})$ are coplanar then show that

$$[\bar{a}\ \bar{b}\ \bar{d}]+[\bar{b}\ \bar{c}\ \bar{d}]+[\bar{c}\ \bar{a}\ \bar{d}]=[\bar{a}\ \bar{b}\ \bar{c}]$$

OR

By using vector method, Prove that the altitudes of a triangle are concurrent.

Q.25 Solve the following LPP by using graphical method. Maximize $z=7x+11y$, student to $3x+5y\le 26$, $5x+3y\le 30,\ x\ge 0,\ y\ge 0$.

Q.26 Find the value of k, so that the function f(x) is continuous at the indicated point.

$$\left.\begin{aligned} f(x) &= \frac{\sqrt{3}-\tan x}{\pi-3x} && \text{for } x\ne\frac{\pi}{3} \\ &= k && \text{for } x=\frac{\pi}{3} \end{aligned}\right\} \text{at } x=\frac{\pi}{3}.$$

Q.27 Find the equation of tangent and normal to the curves $y=x^2+4x+1$ at (–1, –2).

Q.28 Evaluate $\int \frac{3x+1}{(x-2)^2(x+2)}\,dx$.

Q.29 Find the area of ellipse $\frac{x^2}{4}+\frac{y^2}{25}=1$ using integration.

Q.30 If a body cools from 80° C to 50° C at room temperature of 25° C in 30 minutes, find the temperature of the body after 1 hours.

OR

Solve the differential equations $\left(1+e^{x/y}\right)dx+e^{x/y}\left(1-\frac{x}{y}\right)dy=0$.