Sub: Maths

Standard: 12th (Science) **Date: 11.02.2019**

Time : 3 Hours **Total Marks: 80**

Note:

(1) All questions are compulsory.
(2) The question paper consist of 30 questions divided into four sections A, B, C, D
(3) Section-A contains 6 Multiple Choice Questions of 1 mark each.
Section –B contains 8 questions of 2 marks each. (One of them will have internal option)
Section-C contains 6 questions of 3 marks each. (Two of them will have internal option)
Section-D contains 10 questions of 4 marks each. (Three of them will have internal option)
(4) Use of logarithmic tables is allowed.
(5) Use of calculator is not allowed.
(6) In LPP only rough sketch of graph is expected. Graph paper is not compulsory.

SECTION-A (6 Marks)

Select and write the correct answer from the given alternatives in each of the following questions :

Q.1 The principle solution of equation $\cot x = -\sqrt{3}\ is$

(a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{6}$ (d) $\frac{5\pi}{6}$

Q.2.The angle between two lines having direction ratios $1, -2, -2\ and\ 2, -2\ l\ is$

(a) $\frac{\pi}{4}$ (b) $cos^{-1}\frac{3}{7}$ (c) $cos^{-1}\left(\frac{4}{9}\right)$ (d) $\frac{\pi}{6}$

Q.3 The d.c.s. of line $\frac{x-2}{2} = \frac{2y-5}{3}, z = -1$

(a) $\frac{4}{5}, \frac{3}{5}, 0$ (b) $\frac{4}{5}, 0, \frac{3}{5}$ (c) $\frac{-4}{5}, 0, \frac{3}{5}$ (d) $0, \frac{4}{5}, \frac{3}{5}$

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

(a) $\frac{-1}{2}$ (b) $\frac{1}{2}$ (c) 0 (d) 1

Q.5 The order and degree of the differential equation $\sqrt{1+\left(\frac{dy}{dx}\right)^2} = \left(\frac{d^2y}{dx^2}\right)^{\frac{1}{3}}$ *is*

(a) 2, 3 (b) 3, 2 (c) 1, 2 (d) 2, 2

Q.6 The probability distribution of discrete random variable is defined as

$f(x) = kx^2,$ $0 \leq x \leq 6$

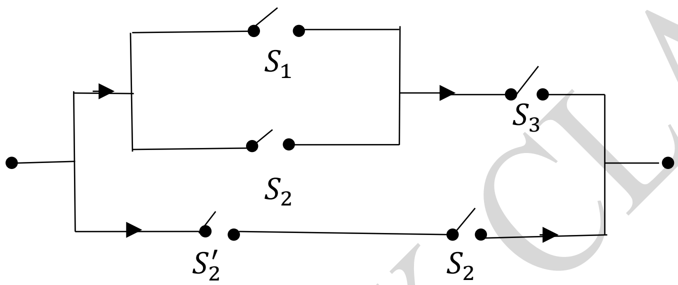
$= 0,$ elsewhere Then the value of $f(4) is$

(a) $\frac{30}{91}$ (b) $\frac{30}{97}$ (c) $\frac{15}{47}$ (d) $\frac{47}{99}$

SECTION-B (16 Marks)

Q.7. Express the following circuit symbolically

Q.8. Show that the points $A(4,5,1), B(5,4,3), C(4,1,6) and\ D(3,3,3) are\ coplanar$



OR

Q.8. Find co-ordinate of the point which divide the line segment joining the points $A(4,-2,5) and\ B(-2,3,7)$ externally in the ratio 8:5

Q.9. Show that no line in the space can make angle $\frac{\pi}{6}$ *and* $\frac{\pi}{4}$ *with* $X - axis$ *and* $Y - axis$.

Q.10. Find vector equation of line passing through point $A(4,2,1) and\ B(2,-1,3)$

Q.11. Find $\frac{dy}{dx}$ *if* $\cos y = x\cos(a+y)$

Q.12. Find the value of x such that $f(x) = 2x^3 - 15x^2 + 36x + 1$ is an increasing function.

Q.13. Find the area of region bounded by curve $y = \sqrt{16 - x^2}$ and the lines *x*=0 and *x*=4.

Q.14. Two cards are drawn at random from 1, 1, 2, 2 and 3. Let X denote the sum of numbers. Find expected value of the sum.

SECTION-C (18 Marks)

Q.15. With usual notation prove that $\frac{\sin(A-B)}{\sin(A+B)} = \frac{a^2-b^2}{c^2}$

Q.16. Using vector method prove that the medians of triangle are concurrent

Q.17. Find the equation of plane passing through the line of intersection of the planes

$2x - y + z = 3 \; and \; 4x - 3y + 5z = -9$ and parallel to the line $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z-3}{5}$

OR

Q.17. Find the angle between the planes whose vector equation are $\bar{r}.\left(2\bar{\imath} + 2\bar{\jmath} - 3\bar{k}\right) = 5$ and $\bar{r}.\left(\bar{\imath} - 2\bar{\jmath} + 3\bar{k}\right) = 7.$

Q.18. If $y = (\log x)^x - x^{\log x}, then\ find\ \frac{dy}{dx}$

OR

Q.18. If $y = f(u)$ is differentiable function of $u \; and \; u = g(x)$ is differentiable function of x then prove that $\frac{dy}{dx} = \frac{dy}{du}.\frac{du}{dx}$

Q.19. Evaluate $= \int \frac{x^2}{(1+x^4)^2}\, dx$

Q.20. A radar complex consist of eight units that operate independently. The probability that a unit detects an incoming missile is 0.9. Find the probability that an incoming missile will

(a) not be detected by any unit.

(b) be detected by at mo0st three units.

SECTION-D (40 Marks)

Q.21. Construct the truth table of the statement pattern $(p \to q) \leftrightarrow (p \wedge q)$ and interprete your result.

Q.22. If three numbers are added there sum is 15. If the second number is subtracted from the sum of first and third number, then we get 5. If twice of first number is added to the second and third number and subtracted from the sum, we get 4. Use matrices and find that numbers.

OR

Q.22. Find inverse of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ if it exist by using elementary rows transformation.

Q.23.Find the general solution of $\sqrt{3}\cos x - \sin x = 1.$

Q.24. Show that the acute angle between the lines given by equation $ax^2 + 2hxy + by^2 = 0 \; is \; \theta = tan^{-1}\left|\frac{2\sqrt{h^2-ab}}{a+b}\right|$

Hence find the angle between the lines represented by equation $3x^2 - 4\sqrt{3}xy + 3y^2 = 0$.

Q.25. Solve the following LPP graphically

Minimize $Z = x + 2y, Subject\ to\ x + 2y \geq 50, 2x - y \leq 0, 2x + y \leq 100, x \geq 0, y \geq 0$

Q.26. If function $f(x)$ is continuous in the interval $[-2, 2]$ then find the value of (a+b) where

$$f(x) = \frac{\sin ax}{x} - 2 \qquad \text{for } -2 \leq x < 0$$

$$= 2x + 1 \qquad \text{for } 0 \leq x \leq 1$$

$$= 2b\sqrt{x^3 + 3} - 1 \qquad \text{for } 1 < x \leq 2$$

Q.27. Find the minimum and maximum value of function $f(x) = x^2 e^x$

OR

Q.27.Find the equation of tangent and normal to the curve $x = acos^3\theta, y = asin^3\theta\ at\ \theta = \frac{\pi}{4}$

Q.28.Evaluate $\int cos^{-1}(\sqrt{x})dx$

Q.29 Prove that $\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a - x)dx$

OR

Q.29. Evaluate $\int_0^{\pi} \frac{x \tan x}{\sec x + \cos x} dx$

Q.30. The slope of tangent to the curve at any point is equal to $y + 2x$. Find the equation of the curve passing through the origin.