Model Question Paper

Class-XII (Session : 2020-21) (SOS)

Subject-Mathematics

Time Allowed : 3 hrs **Maximum Marks : 100**

Special Instructions:-

Same as that of Previous Years Annual question paper (SOS) March 2020.

(i) Question numbers 1 to 10 are multiple choice questions of 1 mark each. Q. no. 11 to 14 are 3 marks each. Q. no. 15 to 26 are of 4 marks each and Q. no. 27 to 31 and of 6 marks each.

(ii) All questions are compulsory.

(iii) 30% more internal choices have been provided from 70% of the syllabus, as 30% syllabus has been deleted due to COVID-19 Pandemic for the session 2020-21 only.

1. If $\text{Sin}^{-1} x = y$ then 1

   (a) $0 \le y \le \pi$ (b) $\frac{-\pi}{2} \le y \le \frac{\pi}{2}$

   (c) $0 \le y < \pi$ (d) $0 < y < \pi$

2. If A is symmetric as well as skew symmetric matrix then 1

   (a) A is diagonal matrix (b) A is zero matrix

   (c) A is unit matrix (d) none of these.

3. The derivative of $\text{Sec}^{-1} x$ is 1

   (a) $\frac{1}{|x|\sqrt{1-x^2}}$ (b) $\frac{-1}{|x|\sqrt{1-x^2}}$

   (c) $\frac{1}{|x|\sqrt{x^2-1}}$ (d) none of these

4. The slope of normal to the curve $y = 2x^2 + 2\sin x$ at $x = 0$ is 1

(a) 3 (b) $\frac{1}{3}$ (c) -3 (d) $\frac{-1}{3}$

5. $\int \frac{dx}{\sqrt{9x - 4x^2}}$ equal to 1

(a) $\frac{1}{9}\sin^{-1}\left(\frac{9x-8}{8}\right)+c$ (b) $\frac{1}{2}\sin^{-1}\left(\frac{8x-9}{9}\right)+c$

(c) $\frac{1}{3}\sin^{-1}\left(\frac{9x-8}{8}\right)+c$ (d) $\frac{1}{2}\sin^{-1}\left(\frac{9x-8}{8}\right)+c$

6. The number of arbitrary constants in particular solution of a differential equation of fourth order are 1

(a) 3 (b) 4 (c) 0 (d) 2

7. The value of $\hat{i}\left(\hat{j}\times\hat{k}\right)+\hat{j}.\left(\hat{i}\times\hat{k}\right)+\hat{k}.\left(\hat{i}\times\hat{j}\right)$ 1

(a) 0 (b) -1 (c) 1 (d) 3

8. If $\vec{a}$ is a non zero vector of magnitude a and λ, a non zero scalar, then $\lambda\vec{a}$ is a unit vector if 1

(a) $\lambda = 1$ (b) $\lambda = -1$ (c) $a = |\lambda|$ (d) $a = \frac{1}{|\lambda|}$

9. If a line has direction ratios $(2, -1, -2)$ then its direction cosines will be

(a) $< \frac{2}{3}, \frac{-1}{3}, \frac{-2}{3} >$ (b) $< \frac{-1}{3}, \frac{2}{3}, \frac{-2}{3} >$

(c) $< \frac{-2}{3}, \frac{2}{3}, \frac{1}{3} >$ (d) NOT

10. If $P(A) = \frac{6}{11}$, $P(B) = \frac{5}{11}$ and $P(A \cup B) = \frac{7}{11}$ then $P(A \cap B)$ is 1

(a) $\frac{6}{11}$ (b) $\frac{7}{11}$ (c) $\frac{5}{11}$ (d) $\frac{4}{11}$

11. Find x an y if $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$ 3

Or

If $A' = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$ then find (A+2B)'

12. Find the value of K so that the function f is continuous at indicated point. 3

$$f(x) = \begin{cases} kx + 1 & \text{if } x \leq 5 \\ 3x - 5 & \quad x > 5 \end{cases} \text{ at } x = 5$$

Or

Differentiate $\text{Cos}\left(\sqrt{x}\right)$ w.r.t x.

13. Find the interval in which the given function is strictly increasing or decreasing for $f(x) = 6 - 9x - x^2$ 3

14. Find the general solution of the differential equation 4

$$\frac{dy}{dx} + \frac{y}{x} = x^2$$

Or

Find the general solution of differential equation

$\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$

15. Show that the relation R in the set {1,2,3} given by R = {(1,2), (2,1)} is symmetric but neither reflexive nor transitive. 4

Or

Find g of & fog if.

$f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$

16. Prove that $\cos^{-1}\frac{12}{13} + \sin^{-1}\frac{3}{5} = \sin^{-1}\frac{56}{65}$ 4

Or

Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right) - \frac{3\pi}{2}$ in the simplest form.

17. By using the properties of determinants prove that 4

$$\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1-x^3\right)^2$$

Or

If $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$ verify $(AB)^{-1} = B^{-1} A^{-1}$

18. Find $\frac{dy}{dx}$ of $(\log x)^{\cos x}$ 4

Or

Find $\frac{dy}{dx}$, if $x = at^2$ and $y = 2at$.

19. Evaluate $\int \frac{1}{1+\tan x} dx$ 4

Or

Evaluate:- $\int \frac{1}{\sqrt{x^2 + 2x + 2}} dx$

20. Evaluate:- $\int \frac{x}{(x-1)(x-2)(x-3)} dx$ 4

Or

Evaluate:- $\int \frac{xe^x}{(1+x)^2} dx$

21. Using properties of definite intergral. 4

Evaluate:- $\int_0^{\frac{\pi}{2}} \frac{\sin^4 \times dx}{\text{Sin}^4 x + \text{Cos}^4 x}$

22. Find the general solution of the differential. 4
equation $(x^2 - y^2)\, dx + 2xy\, dy = 0$

Or

Find the particular solution of the differential equation

$\frac{dy}{dx} + 2y \tan x = \sin x$, $y = 0$ where $x = \frac{\pi}{3}$

23. If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda \vec{b}$ is perpendicular to $\vec{c}$ then find the value of λ. 4

Or

Find the area of parallelogram whose adjacent sides are given by vectors $\vec{a} = 3\hat{i} + \hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$

24. Find the values of P so that the lines. 4

$$\frac{1-x}{3}=\frac{7y-14}{2p}=\frac{z-3}{2} \text{ and } \frac{7-7x}{3p}=\frac{y-5}{1}=\frac{6-z}{5} \text{ are at right}$$

angles.

Or

Find the equation of the plane with intercepts 2,3 and 4 on the x,y,z-axis respectively.

25. A die is thrown. If E is the event 'the number appearing is multiple of 3 and 4' F be the event the number appearing is even then find whether E and F are independent? 4

26. From a lot of 30 bulbs which include 6-defective, a sample of 4-bulbs in drawn at random with replacement. Find the probability distribution of the number of defective bulbs. 4

Or

Find the probability of throwing at most 2 sixes in 6 throws of a single die.

27. Solve the following system of linear equation using matrix method. 6
$2x-3y+5z=11$, $3x+2y-4z=-5$; $x+y-2z=-3$.

28. Find two positive number x & y such that their sum is 35 and the product x^2y^2 is maximum. 6

Or

Prove that the curve $5x=y^2$ and $xy=k$ cut at right angle it $8k^2=1$.

29. Using the intergration find the area of region bounded by the triangle whose vertices are (1,0), (2,2) and (3,1). 6

Or

Find the smaller area enclosed by the circle. $x^2+y^2=4$ and the line $x+y=2$.

30. Find the shortest distance between the lines 6

$$\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1} \text{ and } \frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$$

Or

Find the equation of plane passing through the point (–1,3,2) and perpendicular to each of the planes $x + 2y + 3z = 5$ and $3x + 3y + z = 0$

31. Maximize $z = 3x + 2y$

Subject to constraints

$x + 2y \leq 10$

$3x + y \leq 15$

$x >,0, z>,0$