Sample Paper (Applied Mathematics)

Year 2020 Class 12th

(Topic-wise Break Up)

Topic	No.Of 1 Mark Questions	No.Of 2 Marks Questions	No.Of 4 Marks Questions	No of 6 Marks Questions	Total Marks
Matrices and Determinants	---	---	02	02	20
Limits and continuity of functions	---	---	03	---	12
Derivative	---	01	01	01	12
Application of Derivatives	---	02	---	01	10
Integrals	---	03	01	01	16
Differential Equations	---	---	01	01	10
Statics	02	---	02	---	10
Dynamics	02	02	01	---	10
Total Questions	04	08	11	06	100Marks 29 Questions

- Note for Paper Setters:
- The sample question papers comprises of 29 Questions, divided into (04) four sections A, B,C,D.
- Section A comprises of Multiple Choice Questions from (Q.1 to Q.4) each of 1 Mark
- Section B comprises of 8 questions (Q 5 to Q. 12) each of 2 marks.
- Section C comprises of 11 Questions (Q 13 to Q23) each of 4 marks.
- Section D comprises of 6 Questions (Q24 to Q 29) each of 6 marks.

Subject: Applied Mathematics.

Class 12^{th}. Max.Marks=100, Time: 3 hours.

Section A (Multiple Choice Questions) 4Qx1M= 4 marks

Q.No.1) The resultant of two forces P and Q are at right angles to P. The angle between two forces is

(a) $cos^{-1}(\frac{P}{Q})$ (b) $cos^{-1}(-\frac{P}{Q})$ (c) $cos^{-1}(\frac{Q}{P})$ (d) $Sin^{-1}(\frac{P}{Q})$

Q.2) If $s=t^{\frac{1}{2}}$, then the acceleration is proportional to the

(a) Cube of velocity (b) Square of velocity

(c) Fourth power of velocity (d) Velocity

Q.3) The greatest height of the projectile is given by $H=\frac{u^2 sin^2 \alpha}{2g}$ (True/False)

Q.4) ABCD is a quadrilateral. Forces represented by $\overrightarrow{DA}, \overrightarrow{DB}, \overrightarrow{AC}$ and $\overrightarrow{BC}$ act on a particle are equivalent to:

(a) $2\overrightarrow{DC}$ (B) $3\overrightarrow{DC}$ (c) $3\overrightarrow{BC}$ (d) None

Section B (very short answer type Question) 8Qx2M=16 marks

Q.5) Differentiate $x^2 + xy + y^2$ with respect to x.

Q.6) Find the approximate change in surface area of cube of side x meters

Caused by decreasing the side by 1%.

Q.7) Prove that the curves $x=y^2$ and $xy=k$ cut at right angles if $8k^2=1$

Q.8) Prove that v=u+at

Q.9) A stone is thrown upwards with a velocity of 24.5m/sec.After what time will it reach the ground?

Q.10) Evaluate the definite integral $\int_2^3 \frac{2x}{x^2+1} dx$

Q.11) Evaluate the integral $\int xlogxdx$

Q.12) Evaluate the integral $\int (\frac{1}{x} - \frac{1}{x^2})e^x dx$

Sec C (Short Answer Type Questions) 11Qx4M=44 marks

Q.13) Find the inverse of the matrix A=$\begin{bmatrix} 1 & 0 & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$

Q.14) Prove that $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$

Q.15) If y= 5Cosx-3Sinx prove that $\frac{d^2y}{dx^2} + y = 0$

Q.16) Find the values of 'a' and 'b' such that the function defined by:

f(x)=$\begin{cases} 5 \ , x \leq 2 \\ ax + b, \ 2 < x < 10 \\ 21 \ , x \geq 10. \end{cases}$ is a continues function.

Q.17) If y=$x^x - 2^{Sinx}$ find $\frac{dy}{dx}$

Q.18) Find $\int \frac{e^{2x}-1}{e^{2x}+1} dx$

19) Express the matrix A=$\begin{bmatrix} 3 & 5 \\ 1 & -1 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

20) Find the value of k so that the function f is continuous at the indicated point

$f(x) = \begin{cases} kx^2, \ x \leq 2 \\ 3, \ x > 2 \end{cases}$ at x=2

Q.21) At what angle must the forces P+Q and P-Q act so that their resultant is $\sqrt{P^2 + 3Q^2}$.

Q.22) State and prove Lami's theorem.

Q.23) The velocity of the particle is given by v^2 =2x(2+x)(2-x).Find an expression for its acceleration 'a' .Prove that $27v^4$=4(4-a)$(8 + a)^2$

Section D (Long Answer Type Questions) 6Qx6M=36marks

Q.24) Using properties of determinants show that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

(OR)

Using Matrix Method to solve the system of equations x-y+z=4 ;2x+y-3z=0 ; x+y+z=2

Q.25) Solve the system of equations by Cramer's Rule

2x+3y+3z=5, x-2y+z=-4, 3x-y-2z=3 (OR)

If A=$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$,Show that $A^3 - 6A^2$ +5A+11I=O.Hence find A^{-1}

Q.26) Evaluate $\int_0^{\pi/2} \sqrt{sin\emptyset} cos^5\emptyset \, d\emptyset$ (OR)

Find the area of the region enclosed by the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2} = 1$

Q.27) 20) Find the particular solution of the differential equation $x(x^2 - 1)\frac{dy}{dx} = 1$, y=0 ,x=2 (OR)

Find the general solution of the differential equation $\frac{dy}{dx} + 2y = Sinx$

Q.28) If $x^y + y^x = 1$ find $\frac{dy}{dx}$ (OR)

If x=$\sqrt{a^{sin^{-1}t}}$ and y=$\sqrt{a^{cos^{-1}t}}$ show that $\frac{dy}{dx} = \frac{-y}{x}$

Q.29) Find the points on the curve $\frac{x^2}{9} + \frac{y^2}{16}$=1 at which the tangents are

(i) Parallel to x-axis (ii) Parallel to y-axis (OR)

Show that the semi vertical angle of the cone of the maximum volume and of given slant height $tan^{-1}\sqrt{2}$