Mathematics	Model Paper	Marks: 20
Paper: Part II	Intermediate	Time: 30 Minutes

Section-A

Note: Each Question has four possible options. Tick (✓) the correct option. **(20x1=20)**

1	$\lim_{x\to0}\left(\frac{e^x-1}{x}\right)=$							
	A	0	B	∞	C	1	D	-1
2	$\lim\limits_{x\to0}\left(\frac{\sin ax}{\sin bx}\right)=$							
	A	$\frac{a}{b}$	B	$\frac{b}{a}$	C	$\frac{1}{ab}$	D	ab
3	Which of the following represent $f^{-1}(5)$ if $f(x)=x^{\frac{1}{3}}+2$							
	A	1	B	3	C	9	D	27
4	$if\ y=\cos(ax+b)\ then\ y_2=?$							
	A	$-a\ \sin(ax+b)$	B	$-a^2\ \cos(ax+b\,)$	C	$a^3\ \sin(ax+b)$	D	$-a^2\ \sin(ax+b)$
5	A differentiable function $f(x)$ has relative maxima at c if							
	A	$f"(c)=0$	B	$f"(c)>0$	C	$f"(c)<0$	D	$f"(c)=1$
6	If $y=\sin^{-1}\frac{x}{a}$, then y_1 is							
	A	$(a^2+x^2)^{1/2}$	B	$(a^2-x^2)^{-1/2}$	C	$(a^2+x^2)^{-1/2}$	D	$(a^2-x^2)^{1/2}$
7	$\int\tan x\,dx=$							
	A	$\ln\lvert\cos x\rvert+c$	B	$-\ln\lvert\sin x\rvert+c$	C	$\ln\lvert\sec x\rvert+c$	D	$\ln\lvert\sin x\rvert+c$
8	A particle is moving in a straight line and its acceleration is $a=2t-7$, then its velocity v is:							
	A	2	B	-5	C	t^2-7+c	D	t^2-7t+c
9	$\int e^x[\frac{1}{x}+\ln x\,]dx=$							
	A	$\frac{e^x}{x}+c$	B	$e^x\ln x+c$	C	$\frac{e^x}{\ln x}+c$	D	xe^x+c
10	$\int\frac{x}{x+2}dx=$							
	A	$x-\ln(x+2)+c$	B	$\ln(x+2)+c$	C	$\frac{1}{2}\ln(x+2)+c$	D	$x-2\ln(x+2)+c$
11	The location in the plane of the point $P(x,y)$ for which $y=0$ is							
	A	First Quadrant	B	Second Quadrant	C	X-axis	D	Y-axis

12	The equation of line through $(8,-3)$ having slope 0 is							
	A	$y-3=0$	B	$y+3=0$	C	$x-3=0$	D	$x+3=0$
13	The pair of lines represented by $ax^2+2hxy+by^2=0$ are real and coincident if							
	A	$h^2=ab$	B	$h^2<ab$	C	$h^2>ab$	D	$h^2+ab=0$
14	The inequality $2x-3y\leq 6$ has a solution							
	A	$(4,2)$	B	$(2,-3)$	C	$(0,-3)$	D	$(4,0)$
15	The equation $x^2+y^2+4x+12y+15=0$, represents							
	A	Circle	B	Parabola	C	Ellipse	D	Hyperbola
16	The directix of the parabola $x^2=-16y$, is							
	A	$x+4=0$	B	$x-4=0$	C	$y+4=0$	D	$y-4=0$
17	In an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, the length of Latusrectum is							
	A	$\frac{2a}{b^2}$	B	$\frac{2b^2}{a}$	C	$\frac{2b}{a^2}$	D	$\frac{2b^2}{a^2}$
18	Which of the following triples can be direction angles of a single vector							
	A	$45°, 45°, 60°$	B	$30°, 45°, 60°$	C	$45°, 60°, 60°$	D	$30°, 45°, 90°$
19	The projection of $\hat{\imath}+\hat{\jmath}$ along $\hat{k}$ is							
	A	1	B	0	C	$1/\sqrt{2}$	D	$-1/\sqrt{2}$
20	The value of $2\hat{\imath}\times 2\hat{\jmath}.\hat{k}$ is							
	A	0	B	1	C	2	D	4

Mathematics	**Model Paper**	**Marks: 80**
Paper: Part II	**Intermediate**	**Time: 2.30 HOURS**

Section-B

Note: Attempt twelve (12) short questions.

Q. 1 Write short answers of any eight parts. **(12x4=48)**

(i) If $f(x)=\frac{1}{\sqrt{x-1}}$ and $g(x)=(x^2+1)^2$ find (a) $fof(x)$ (b) $gof(x)$

(ii) evaluate $\lim_{\theta\to 0}\frac{1-\cos p\theta}{1-\cos q\theta}$

(iii) Differentiate $\frac{(1+\sqrt{x})\left(x-x^{\frac{3}{2}}\right)}{\sqrt{x}}$ w.r.t x

(iv) If $y=\tan\left[2\tan^{-1}\frac{x}{2}\right]$ then find $\frac{dy}{dx}$.

(v) Show that $2^{x+h}=2^x\left\{1+(\ln 2)h+\frac{(\ln 2)^2h^2}{2!}+\frac{(\ln 2)^3h^3}{3!}+\ldots\right\}$

(vi) Solve the differential Equation $y-x\frac{dy}{dx}=2(y^2+\frac{dy}{dx})$.

(vii) Evaluate the integral $\int\frac{dx}{\frac{1}{2}\sin x+\frac{\sqrt{3}}{2}\cos x}$

(viii) Evaluate the integral $\int_{-1}^{5}|x-3|\,dx$

(ix) The point A (-1, 2), B (6,3), C (2,-4) are vertices of a triangle. Show that the line joining the mid-point D of AB and the midpoint E of AC is parallel to BC and DE $=\frac{1}{2}$ BC.

(x) Find the distance of point p (6 , -1) to the line $6x-4y+9=0$.

(xi) Graph the feasible regions subjects to following constraints $2x-3y\leq 6$, $2x+y\geq 2$, $x\geq 0$, $y\geq 0$. (

(xii) Find equation of circle passing through the A(3, -1), B(0,1) and having a centre at 4x-3y-3=0.

(xiii) find equation of parabola having focus (-3, 1) and directrix x=3.

(xiv) find equation of ellipse having focus (0, 3), centre (0,0) and vertex at (0,4).

(xv) Find constant α so that $\vec{v}$= 3i+αj+4k and $\vec{w}$=4i+5j+αk are perpendicular.

(xvi) Find volume of tetrahedron whose vertices are are A (-2, 1, 4), B (3, 2, 5), C (-3, -5, 0), D (5, 8, 9)

Section-C

Note: Attempt any four questions from this section. **(4x8=32)**

Q. 3 Find values of m and n if given function is continuous at x=3, also state domain and range of function taking m=1 and n=2 $f(x)=\begin{cases} mx \text{ if } x<3 \\ n \text{ if } x=3 \\ -2x+9 \text{ if } x>3 \end{cases}$

Q. 4 From ab-initio method, find derivative $\frac{1}{(ax+b)^n}$

Q. 5 Evaluate the integral $\int \frac{2x^2-1}{x^4+x^2+1}dx.$

Q. 6 (a) Find the coordinates of the vertices of triangle formed by the lines $x-2y-6=0, 3x-y+3=0; 2x+y-4=0$

(b) Also find measure of angles of triangle.

Q. 7 A farmer plans to mix two types of food to make a low cost feed for animals. A bag of food P cost him Rs. 40 and contains 5 units of proteins and 4 units of vitamins. A bag of food Q cost him Rs. 50 and contains 4 units of proteins and 8 units of vitamins. How many bags of food P and Q should be consumed in order to have 120 units of proteins and 144 units of vitamins at minimum costs?

Q.8 By rotation of axes, eliminate the xy-term in the equation $9x^2+12xy+4y^2+2x-3y=0$. Identify the conics and find its elements.