

CHAPTER-4

FORTRAN EXPRESSIONS

(ফোরট্রান এক্সপ্রেশন)

4.1. Rules for convert mathematical expression to Fortran expression
 [মাথিমেটিক এক্সপ্রেশন হতে ফোরট্রান এক্সপ্রেশন এ রূপান্তর করার নিয়মগুলো নিম্নরূপ]

In Mathematics	In Fortran
+ (যোগ)	+
- (বিয়োগ)	-
× (গুণ)	* (Asterisk / Times)
÷ (ভাগ)	/ (Slash)
= (সমান)	=
সূচকীকরণ (power)	** (Double Asterisk)
\sqrt{x} (Square root of x)	SQRT(X)
$ x $ (Absolute value of x)	ABS(X)
e^x (Exponential of x)	EXP(X)
$\log x$ or $\log_e x$ or $\ln x$	ALOG(x) or LOG(X)
$\log_{10} x$	ALOG10(X) or LOG10(X)
$\sin x$	SIN(X)
$\cos x$	COS(X)
$\tan x$	TAN(X)
$\sec x$	1.0/COS(X)
cosecx	1.0/SIN(X)
$\cot x$	1.0/TAN(X) or, COS(X)/SIN(X), or COTAN(X)
$\sin^{-1} x$	ASIN(X)
$\cos^{-1} x$	ACOS(X)
$\tan^{-1} x$	ATAN(X)
$\cos 32^\circ$	COS (32.0 * 3.14159/180.0)
$\sinh x$	SINH(X)
$\cosh x$	COSH(X)
() (১ম বন্ধনী)	() (Parenthesis)
{ } (২য় বন্ধনী)	() (Parenthesis)
[] (৩য় বন্ধনী)	() (Parenthesis)
— (রেখা বন্ধনী)	() (Parenthesis)

লক্ষণীয় যে, নিম্নলিখিত প্রতীক (symbol) গুলি Mathematical expression হতে Fortran expression এ রূপান্তর করার সময় সেগুলিকে উচ্চারণ করে লিখতে হবে। যেমন :

α - Alpha	π - Pi	μ - Mu
β - Beta	θ - Theta	η - Eta
γ - Gamma	ϕ - Phi	ρ - Rho
δ - Delta	ψ - Psi	σ - Sigma
λ - Lamda	ω - Omega	Ω - Comega

Convert the following into Fortran [নিম্নলিখিতগুলো Fortran এ অনুবাদ করুন]	
Mathematical expression	Fortran expression
1. $x = [(a+b)^2 + (3c)^3]^{1/6}$ [NU(Pass)-2010]	$X = ((A+B) ** 2 + (3.0 * C) ** 3) ** (1/6)$
2. $a + \frac{b}{c} + d$	$A + B/C + D$
3. $\frac{a+b}{c+d}$	$(A+B)/(C+D)$
4. $a^3 - b^3$	
5. $3 + \frac{2a}{b+5/c}$ [NU(Pre)-2000]	$A ** 3 - B ** 3$ $3.0 + (2.0 * A/(B + 5.0/C))$
6. $\sqrt{b^2 - 4ac}$	
7. $\tan^{-1} \{\log_{10}(a + 5b)^n\}$	$SQRT(B**2 - 4.0 * A * C)$
8. $\sin^{-1} (x + y)$	$ATAN(ALOG10(A + 5.0 * B) ** N)$
9. $e^x + \left\{ \frac{x^n}{\ln(xy)} \right\}^{1/2}$	$ASIN(X + ABS(Y))$ $ABS(EXP(X) + (X ** N / ALOG(X * Y)) ** 0.5)$
10. $e^{a+x} \geq (a-2)^7$ [NU(Pre)-2017]	$(EXP(A + X).GE. (A - 2)**7)$
11. $\sin(2n\pi + x)$	$SIN(2.0 * FLOAT(N) * 3.14159 + X)$
12. $\frac{\sin x}{ y + \cos z}$	$SIN(X)/(ABS(Y) + COS(Z))$
13. $a + \frac{b}{ m-n }$ [NU(Pass)-10, 17, NU(Pre)-2000]	$A + B/ABS(FLOAT(M - N))$ Or, $A + B/ABS(REAL(M - N))$
14. $3x^2y^2 - 2z + 5 \log_2 x$ [NU(Pre)-2017]	$3.0*X**2*Y**2-2.0*Z$ $ALOG2(X) + 5.0*LOG10(X)*LOG10(2)$
15. $\cos(\log_{10}(a + 3b))$ [NU(Pass)-12]	
16. $e^{x+y} - \sqrt{\sin(x + ny)}$ [DUH-2010]	$COS(ALOG10(A + 3.0 * B))$ $EXP(X + Y) - SQRT(SIN(X + FLOAT(N) * Y))$
17. $a = (i^k + 3c^4)^{m/n}$ [NUH-10, 13 NU(Pass)-11, 17, DUH (Aff. Coll.)-17]	$A = ((REAL(I) ** J) ** K + 3.0 * C ** 4)**$ $(FLOAT(M)/FLOAT(N))$
18. $\sqrt{\frac{a^2}{b+c}}$	$SQRT(A ** 2/(B + C))$
19. $\sqrt{5x^2 + 8y^2}$ [NU(Pass)-2017]	$SQRT(5.0 * X ** 2 + 8.0 * Y ** 2)$
20. $e^{a+x} \geq (a+1)^7$ [NUH-14, NU(Pass)-11, 12, DUH (Aff. Coll.)-17]	$EXP(A + X).GE. (A + 1.0) ** 7$
21. $e^{ a } - \frac{b^2}{ c }$	$EXP(ABS(A)) - B ** 2/ABS(C)$
22. $\sqrt{ \cos(a - nb) }$ [NUH-2001]	$SQRT(ABS(COS(A - FLOAT(N) * B)))$
23. $A = \frac{x + a/x}{1 - \frac{a}{1 + 1/x}}$ [NUH-2010]	$A = (X + A/X)/(1.0 - A/(1.0 + 1.0/X))$
24. $a = \sqrt{\sin^{-1}(x + y)}$ [NU(Pass)-04, 12]	$A = SQRT(ASIN(X + ABS(Y)))$
25. $-1 \leq x \leq 5$ [NU(Pass)-2017]	$IF (X.GE. - 1) .AND. (X.LE.5)$
26. $\log_{10} a.b $	$ALOG10(ABS(A * B))$

27. $\frac{x^5}{5!}$	$x ** 5 / (5.0 * 4.0 * 3.0 * 2.0 * 1.0)$
28. $a + \frac{1}{1 + \frac{1}{1 + a}}$	$a + 1.0 / (1.0 + 1.0 / (1.0 + a))$
29. $\sqrt{x^2 / (y + z)}$	$SQRT(X ** 2 / (Y + Z))$
30. $\log_e(x + 3y)^2$	$ALOG((X + 3.0 * Y) ** 2)$
31. $e^{ z } - \frac{y^3}{ x }$	$EXP(ABS(Z)) - Y ** 3 / ABS(X)$
32. $\log_{10}(2a - 3b)^2$	$ALOG10(2.0 * A - 3.0 * B) ** 2$
33. $\log_5 x + \tan \frac{\pi x}{4} + \ln \frac{m}{n}$ [NUH-16, NU(Pas)-18]	$ALOG5(X) + TAN(3.14 * X / 4.0) + REAL(I) * (REAL(M) / REAL(N))$
34. If $x \in (-1, 1)$ হলে $M = 5$ অন্যথায় $M = 7$ [NUH-2016]	<pre> IF (X.GT.-1.0).AND.(X.LE.1.0)) Then M=5 ELSE M=7 ENDIF </pre>
35. $x \in (-2, 2)$ হলে $M = 6$ অন্যথায় $M = 9$. [DUH (Aff. Coll.)-2017]	<pre> IF (X.GT.-2.0).AND.(X.LE.2.0)) Then M=6 ELSE M=9 ENDIF </pre>
36. $s_1 = s_0 + v_0 t + \frac{1}{2} a t^2$	$S1 = S0 + V0 * T + 1.0 / 2.0 * A * T ** 2$
37. Force = $F_x \cos 60^\circ$	$FORCE = FX * COS(60.0 * 3.14159 / 180.0)$
38. $a = \sqrt{\sin^{-1}(x + y)}$	$A = SQRT(ASIN(X + Y))$
39. $\frac{\cos x}{ y + \sin z}$	$COS(X) / (ABS(Y) + SIN(Z))$
40. $\sqrt{ \sin(x - 2y) }$	$SQRT(ABS(SIN(X - 2.0 * Y)))$
41. $y = mx + \log_{10}a$	$Y = FLOAT(M) * X + ALOG10(A)$
42. $q = \ln(x - y) + e^{-x^2}$	$Q = ALOG(ABS(X - Y)) + EXP(- (X ** 2))$
43. $\sin(x + 2y) - e^{x+y}$	$SIN(X + 2.0 * Y) - EXP(X + Y)$
44. $\frac{1}{ a - c } + b$	$1.0 / ABS(A - C) + B$
45. $\frac{e^{x+y}}{\sin(xy)} + e^{x^2y}$ [NUH-04, 15, NU(Pas)-09, 16]	$EXP(X + Y) / SIN(X * Y) + EXP((X ** 2) * Y)$
46. $\tan^{-1} \{\log_{10}(a + 5b)^n\}$	$ATAN(ALOG10((A + 5.0 * B) ** N))$
47. $\sin x + \cos x + e^{ x }$ [NU(Pass)-2010]	$SIN(X) + COS(X) + EXP(ABS(X))$
48. $z = \sin^{-1}(x + y)$	$Z = ASIN(X + ABS(Y))$
49. $S = \tan^{-1} (x/(y + ax))$	$S = ATAN(X / (Y + A * X))$
50. $\frac{AB}{C + \frac{DF}{G} + H} + E$	$(A * B) / (C + (D * F / G) + H) + E$
51. $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ [NUH-2000]	$DEL = SQRT(S * (S - A) * (S - B) * (S - C))$

52. $e^{xy} - \sin(x + ny)$

$$\text{EXP}(X + Y) - \text{SIN}(X + \text{FLOAT}(N) * Y)$$

$$\text{COS}(\text{ALOG10}(\text{ABS}(A - 3.0 * B)))$$

$$\text{FLOAT}(M0) / \text{SQRT}(1.0 - U^2 * U/C)$$

[NU(Pass)-08, 12, NU(Pre)-04, 1]

53. $\cos(\log_{10}|a - 3b|)$

54. $m_0 / \sqrt{1 - \frac{u^2}{c^2}}$

55. $(i^j + 5e^k)^{m/n}$

56. $\sin(x + 2y) - e^{xy}$

(REAL(1) ** J + 5.0 * C**4) **

(REAL(M) / REAL(N))

$\text{SIN}(X + 2.0 * Y) - \text{EXP}(X + Y)$

57. $\sin(x - 2y) + e^{xy} - |x^2 - y^2| = \text{SIN}(X - 2.0 * Y) + \text{EXP}(X * Y) - \text{ABS}(X^{**2} - Y^{**2})$

58. $\left| \sqrt{x - y^3} - \frac{z^2}{\cos(a + b)} \right| = \text{ABS}(\text{SQRT}(X - Y^{**3}) - Z^{**2} / \text{COS}(A + B))$

[NUH-2001, NU(Pass) 2000, 200]

59. $\left| \sqrt{a - b^2} - \frac{c^2}{\sin(x + y)} \right| = \text{ABS}(\text{SQRT}(A - B^{**2}) - C^{**2} / \text{SIN}(X + Y))$

60. $\frac{\sqrt[3]{a^2} + \sqrt{a^3}}{\sqrt{a} \sqrt{b} + a} = (((A^{**2})^{**}(1.0/3.0)) + \text{SQRT}(A^{**3})) / (\text{SQRT}(A * \text{SQRT}(B)) + A)$

[NUH-2006, NU(Pass)-2009, 2013]

61. $(a^{b^2} + b^{a^2}) \left(a + b + \frac{ab}{a + b} \right) = (((A^{**B})^{**2} + ((B^{**A})^{**2})) * (A + B + (A * B) / (A + B)))$

62. $abc + \frac{1}{ab} + \frac{bc}{ab + bc} + \frac{ab + bc + ca}{\frac{(a + b + c)}{abc}} =$

[NUH-2009, 2015]

$A * B * C + (1.0/A * B) + B * C / (A * B + B * C) + (A * B + B * C + C * A) / ((A + B + C) / (A * B * C))$

63. $\frac{x^3}{\cos(x + y)} + \sqrt{x^2 - y^2} + e^{xy} = X^{**3} / \text{COS}(X + Y) + \text{SQRT}(\text{ABS}(X^{**2} - Y^{**2})) + \text{EXP}(X * Y)$

[NUH-2011]

64. $G = \frac{1}{2} \log_{10} \frac{1 + |\sin \theta|}{1 - |\sin \theta|}; G = 0.5 * \text{ALOG10}((1.0 + \text{ABS}(\text{SIN}(\text{THETA}))) / (1.0 - \text{ABS}(\text{SIN}(\text{THETA}))))$

65. $x = \sin^{-1} \{ \log_{10}(|\sqrt{a - b^2 c}|)^{1/2} \}; X = \text{ASIN}(\text{ALOG10}(\text{ABS}(\text{SQRT}(A) - (B^{**2} * C))^{**0.5})$

[NUH-2003, 2004, NU(Pre)-2008]

66. $x = abc + \frac{1}{ab} + \frac{bc}{ab + bc} + \frac{ab + bc + ca}{\frac{a + b + c}{abc}}$

[NUH-04, NU(Pre)-12, 14]

$X = A * B * C + 1.0 / (A * B) + B * C / (A * B + B * C) + (A * B + B * C + C * A) / ((A + B + C) / (A * B * C))$

67. $\text{sum} = \log_{10} \{ \sin^2(\sqrt{|u - v|}) e^{-x^2}$

$\text{SUM} = \text{ALOG10}((\text{SIN}(\text{SQRT}(\text{ABS}(U - V)))))^{**2} * \text{EXP}(-(X^{**2}))$

[NUH-2006]

68. $y = \sin^{-1} x + \ln |u^2 - v^2|^{1/2}; Y = \text{ASIN}(X) + \text{ALOG}(\text{ABS}(U^{**2} - V^{**2}))^{**1.0} / \text{FLOAT}(N)$

69. $A = \frac{1}{2} \ln \left\{ \frac{1 + \sin \theta}{1 - \sin \theta} \right\}; A = 0.5 * \text{ALOG}(\text{ABS}(1.0 + \text{SIN}(\text{THETA}))) / \text{ABS}(1.0 - \text{SIN}(\text{THETA}))$

[NU(Pass)-2011]

70. $\frac{\sqrt[3]{a^2} + \sqrt{a^3}}{\sqrt{a} \sqrt{b} + a} = ((A^{**2})^{**}(1.0/3.0) + (A^{**3})^{**0.5}) / \text{SQRT}(A * \text{SQRT}(B) + A)$

[NUH-2010, 2015, NU(Pre)-2006]

$$71. \sin(x + 2y) - e^{xy} + \frac{\cos x}{|y| + \sin z} = \sin(x + 2.0 \cdot y) - \exp(x + y) + \cos(x) / (\text{ABS}(y) + \sin(z))$$

[NUH-2004(Old), NU(Pass)-2007]

$$72. a = \sqrt{\sin^{-1}(x + |y|)} \quad A = \text{SQRT}(\text{ASIN}(x + \text{ABS}(y)))$$

[NU(Pre)-2017]

$$73. S = \log(\sin(\sqrt{u^2 + v^2})); S = \text{ALOG}(\text{SIN}(\text{SQRT}(U^{**2} + V^{**2})))$$

[NU(Pre)-2004]

$$74. a = \left| \frac{e^x \sqrt{y}}{\cos|x-z|} - \sqrt{x^2 - y^2} \right| + \sin(x^{-1}y)$$

[NUH-2005, 2006, 2004(Old)]

$$A = \text{ABS}(\exp(x) * \text{SQRT}(y) / \cos(\text{ABS}(x - z)) - \text{SQRT}(\text{ABS}(x^{**2} - y^{**2}))) + \sin(y/x)$$

$$75. 2.5 \ln x + \cos 32^\circ + |x^2 + y^2| + \sqrt{2xy}$$

$$= 2.5 * \text{ALOG}(x) + \cos(32.0 * 3.14159 / 180.0) + \text{ABS}(x^{**2} + y^{**2}) + \text{SQRT}(2.0 * x * y)$$

[NU(Pre)-2013]

$$76. y = \frac{\cos\left(\frac{\pi x}{2}\right) - 1}{x - 1} |x_1^2 - x_2^2|$$

[NUH-2000, NU(Pass)-2004]

$$= Y = ((\text{COS}(3.14159 * X / 2.0) - 1.0) * \text{ABS}(X1^{**2} - X2^{**2})) / (X - 1.0)$$

$$77. A = \cos^{-1} \{ \log_{10}(a + 3b)^n \} + \left| \sqrt{x - y^3} - \frac{e^{xy}}{\sin(a + |b|)} \right|$$

[NUH-2000, NU(Pass)-2003, NU(Pre)-2007]

$$= A = \text{ACOS}(\text{ALOG10}((A + 3.0 * B)^{**N}))$$

$$+ \text{ABS}(\text{SQRT}(x - y^{**3}) - \text{EXP}(x * y) / \text{SIN}(A + \text{ABS}(B)))$$

$$78. \sqrt{|\sin(x + 2y)| + \log_{10}(x - 5y)^3}$$

$$\text{SQRT}(\text{ABS}(\sin(x + 2.0 * y))) + \text{ALOG10}((x - 5.0 * y)^{**3})$$

$$79. a = \sin^{-1}(x + |y|) + \left| e^{x^2} - \left\{ \frac{x^n}{\ln(xy)} \right\}^{1/2} \right|$$

[NUH-2000, NU(Pass)-2003, NU(Pre)-2007]

$$= A = \text{ASIN}(x + \text{ABS}(y)) + \text{ABS}(\exp(x^{**2}) - (x^{**N} / \text{ALOG}(x * y))^{**0.5})$$

$$80. 2.5 \ln x + \cos 32^\circ + |x^2 - n^2| + \sqrt{2ny}$$

[NUH-2009]

$$2.5 * \text{ALOG}(x) + \cos(32.0 * 3.14159 / 180.0)$$

$$+ \text{ABS}(x^{**2} - \text{REAL}(n^{**2})) + \text{SQRT}(2.0 * \text{REAL}(n) * y)$$

$$81. a = \tan^{-1} \{ \log_{10}(a + 5b)^n \} + e^{2x}$$

[NU(Pre)-2011]

$$= A = \text{ATAN}(\text{ALOG10}(A + 5.0 * B)^{**N}) + \text{EXP}(2.0 * x)$$

$$82. p = \cos |(2n\pi - \beta)| + \frac{c^2}{\sqrt{\sin^{-1} |(3a - 5b)|}}$$

[NUH-2016, NU(Pass)-2018 DUH (Aff. Coll.)-2017]

$$P = \text{COS}(\text{ABS}(2.0 * \text{FLOAT}(N) * 3.14159 - \text{BETA}))$$

$$+ C^{**2} / \text{SQRT}(\text{ASIN}(\text{ABS}(3.0 * A - 5.0 * B)))$$

$$83. e^x \cos(x - y) - \sqrt{x^2 - y^2} \sin^{-1} x. \exp(x) * \cos(x - y) - \text{SQRT}(x^{**2} - y^{**2}) * \text{ASIN}(x)$$

[NUH-2016, NU(Pass)-2018 DUH (Aff. Coll.)-2017]

$$84. \frac{1}{2} \log_{10} \frac{1 + |\sin \theta|}{1 - |\sin \theta|}, \text{ where } \theta \text{ in degrees}$$

[NU(Pass)-2000]

$$0.5 * \text{ALOG10}((1.0 + \text{ABS}(\sin(\text{THETA} * 3.14159 / 180.0))) / (1.0 - \text{ABS}(\sin(\text{THETA} * 3.14159 / 180.0))))$$

$$85. a = \left| \frac{e^{xy}}{\cos|x-z|} - \sqrt{x^2 - y^2} \right| + \sin^{-1}(x^{-1}y)$$

[NUH-2003, NU(Pass)-2013, NU(Pre)-2009]

$$= A = \text{ABS}(\exp(x * \text{SQRT}(y)) / \cos(\text{ABS}(x - z)) - \text{SQRT}(\text{ABS}(x^{**2} - y^{**2}))) + \text{ASIN}(y/x)$$

$$86. a = \sin^{-1}(x + |y|) + \left| e^{-x^2} - \left\{ \frac{x^n}{\ln(xy)} \right\}^{1/2} \right|$$

[NU(Pass)-2004]

$$A = A \text{ SIN}(x + \text{ABS}(y)) + \text{ABS}(\exp(-(x^{**2})) - (x^{**N} / \text{ALOG}(x * y))^{**0.5})$$

87. $p = \ln|x - y|/e^{-x^2}$ $P = \text{ ALOG}(\text{ABS}(X - Y))/\text{EXP}(-(X^{**2}))$ [NU(Pre)-2003, 2005, 2015, NU(Pre)-2008]
88. $b = \log_{10}x + \cos 54^\circ + |x^4 + y^4| + (i^k + 3c^4)^{m/4}$ $B = \text{ ALOG1O}(X) + \text{ COS}(54.0 * 3.14159/180.0) + \text{ ABS}(X^{**4} + Y^{**4}) + (I^{**J^{**K}} + 3.0*c^{**4})^{**(\text{FLOAT}(M)/4)}$ [NUH-2003, 2005, 2015, NU(Pre)-2008]
89. $x = \sqrt{|\cos|a - nb|}|$ $X = \text{ SQRT}(\text{ABS}(\text{COS}(\text{ABS}(\Lambda - \text{REAL}(N) * B))))$ [NUH-2010, NU(Pass)-2007, 2013]
90. $x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$ $X_1 = (-B + \text{ SQRT}(B^{**2} - 4.0*A*C/2.0*A))$ [NUH-2003, 2005, 2015, NU(Pre)-2008]
91. $b = \left| \frac{e^{1/x} \sqrt{y} - \sqrt{x^2 - y^2}}{\cos|x - z|} \right| + \sin^{-1}\left(\frac{y}{x}\right)$ $b = \text{ abs}((\text{exp}(1.0/x) * \text{sqrt}(y) - \text{sqrt}(x^{**2} - y^{**2}))/\text{cos}(\text{abs}(x - z)) + \text{asin}(y/x))$ [NU(Pre)-2003, 2005, 2015, NU(Pre)-2008]
92. $e^{x+y} - \sqrt{\sin(x + ky)}$: $\text{ EXP}(X + Y) - \text{ SQRT}(\text{SIN}(X + \text{REAL}(K) * Y))$
93. $\log_{10}x + \cos 45^\circ + |x^4 + y^4| + 4xy$
 $= \text{ ALOG1O}(X) + \text{ cos}(45.0 * 3.14159/180.0) + \text{ ABS}(X^{**4} + Y^{**4}) + 4.0*X*Y$
94. $2.5 \ln x + \cos 32^\circ + |x^2 - y^2| + \sqrt{2x^{-1}y}$
 $= 2.5*\text{ALOG}(X) + \text{ COS}(32.0 * 3.14159/180.0) + \text{ ABS}(X^{**2} - Y^{**2}) + \text{ SQRT}(2.0*Y/X)$ [NU(Pre)-2003, 2005, 2015, NU(Pre)-2008]
95. $a + \frac{b}{|m - n|} + \frac{x^4}{4!}$ $= A + B/\text{ABS}(\text{REAL}(M-N)) + X^{**4}/(4.0 * 3.0 * 2.0 * 1.0)$ [NU(Pass)-2003, 2005, 2015, NU(Pre)-2008]
96. $\sin(2n\pi + x) + e^{y \ln(x)}$ $= \text{ SIN}(2.0 * \text{REAL}(N) * 3.14159 + X) + \text{ EXP}(Y * \text{ALOG}(X))$ [NU(Pass)-2008, 2013]
97. $\tan^{-1}\{\log_{10}(a + 5b)^n\} + \sin^{-1}(x + |y|)$
 $= \text{ ATAN}(\text{ALOG 10}(A + 5.0 * B)^{** N}) + \text{ ASIN}(X + \text{ABS}(Y))$ [NU(Pass)-2003, 2005, 2015, NU(Pre)-2008]
98. $x = \sin^{-1}\{\log_{10}(|(\sqrt{a - b^2c})^{1/2}|)\} + \cos 45^\circ$
 $= X = \text{ ASIN}(\text{ALOG 10}(\text{ABS}((\text{SQRT}(a) - B^{**2} * C)^{** 0.5}))) + \text{ cos}(45.0 * 3.14159/180.0)$ [NU(Pre)-2007, 2013]
99. $\sqrt{x^2 + y^2} + e^{xy} = \text{ SQRT}(X^{**2} + Y^{**2}) + \text{ EXP}(X * Y)$ [NU(Pre)-2005, 2014]
100. $\frac{e^{x+y}}{\sin(xy)} + |x - y| = \text{ EXP}(X + Y)/\text{SIN}(X * Y) + \text{ ABS}(X - Y)$ [NU(Pre)-2017]
101. $i^k = I^{**}(J^{**K})$ or $I^{**}J^{**K}$ [NU(Pre)-2005]
102. $\text{SUM} = \sqrt{s(s-a)(s-b)(s-c)} + e^{x^2\sqrt{y}}$
Ans : $\text{SUM} = \text{ SQRT}(S * (X - A) * (S - B) * (S - C)) + \text{ EXP}((X^{**2}) * \text{ SQRT}(Y))$ [NU(Pass)-2007]
103. $x = \sin^{-1}\{\log_{10}x + (|\sqrt{a - b^2c}|)^{1/2}\}$
 $X = \text{ ASIN}(\text{LOG 10}(x) + (\text{abs}(\text{sqrt}(a) - B^{**2} * C))^{** 0.5})$ [NUH-2015, NU(Pre)-2008]
104. $a = \log_{10}x + \cos 54^\circ + |x^4 - y^4| + i^k$
 $A = \text{ LOG1O}(X) + \text{ COS}(54.0 * 3.14159/180.0) + \text{ ABS}(X^{**4} - Y^{**4}) + \text{ REAL}(I^{**}J^{**K})$ [NU(Pre)-2008]
105. $c = \frac{e^{(x+y)}}{\sin(xy)} + i e^{2y} C = \text{ EXP}(X + Y) / \text{ SIN}(X * Y) + \text{ EXP}(\text{EXP}(2) * Y)$ [NU(Pre)-2008]
106. $e^{a+x} \geq (a+1)^{f/g} + \tan^{-1}(\log_{10}a^n)$
 $\text{EXP}(A + X) .GE. (A + 1.0)^{** (F/G)} + \text{ATAN}(\text{LOG 10}(A^{** N}))$ [NU(Pre)-2012]

$$107. a = (I^k + 3C^4)^{m/n} + \frac{xy}{4!}$$

[NU(Pre)-2012, 2014]

$$A = (\text{REAL}(I * J * K) + 3.0 * C ** 4) ** (\text{REAL}(M) / \text{REAL}(N)) + X ** 4 / 24.0$$

$$108. V_0 t + \frac{1}{2} at^2 + F_x \cos 60^\circ$$

$$S = V_0 * T + A * T ** 2 / 2.0 + F_x * \cos(60 * 3.14159 / 180)$$

$$109. x = [(a + b)^2 + (3c)^3]^{a/b}$$

[NU(Pass)-2010]

$$X = ((A + B) ** 2 + (3.0 * C) ** 3) ** (A/B)$$

$$110. z = \sqrt{x^2 + y^2} + (x + y)^{m/n}$$

$$Z = \text{SQRT}(X ** 2 + Y ** 2) + (X + Y) ** (\text{FLOAT}(M) / \text{FLOAT}(N))$$

[NU(Pre)-2011]

$$111. 0.5e^x + \sin 30^\circ + |x^2 + y^2| + \sqrt{x^1 y}$$

[NU(Pre)-2013]

$$0.5 * \text{EXP}(X) + \text{SIN}(30.0 * 3.14159 / 180.0) + \text{ABS}(X**2 + Y**2) + \text{SQRT}(Y/X)$$

$$112. e^{-x} + \log(5 - a) + \text{cosec } 15^\circ + (xy^{-1})^{-1}$$

[NUH-2017]

$$\text{EXP}(-X) + \text{ALOG}(\text{ABS}(5.0 - A)) + 1.0 / \text{SIN}(15.0 * 3.1416 / 180.0) + Y/X.S$$

SOLVED PROBLEMS

Problem-1. Assume that A, B and C have been defined. Write Arithmetic statements, which do the following [মনে কর A, B, C সংজ্ঞায়িত হয়েছে। এরিথমেটিক স্টেটমেন্ট লিখ যা নিম্নলিখিতগুলি সম্পন্ন করবে।]

- (i) Increases the value of A by 5.5 [A এর মান 5.5 বাড়িয়ে দেবে]
- (ii) Double the value of B [B এর মান দিগ্নণ করবে]
- (iii) Cubes the value of C [C এর মানের ঘন নির্ণয় করবে]
- (iv) Stores in PRODUC the product of the values A, B and C. [A, B এবং C এর মানের

(iv) m equals to $m_0 / \sqrt{1 - v^2/c^2}$
 (v) If $\log_{10} x \leq m r^3$ then $y = e^{5x} \sin 2x$

Solution : (i) IF((M .LT. 75) .AND. (M .GT. 45)) STOP

(ii) HYP = SQRT(X**2 + Y**2)

(iii) C = SQRT(A * A + B * B)

Or, C = SQRT(A ** 2 + B ** 2)

(iv) M = INT(REAL(M0)/SQRT(1.0 - V ** 2/C ** 2))

(v) IF ALOG10(X) .LE. FLOAT(M) * R ** 3 THEN

Y = EXP(5.0 * X) * SIN(2.0 * X)

ENDIF

Problem-3. Translate into Fortran : [Fortran এ কৃপাত্তি কর] :

(i) If the values of x exceeds 5.5, then transfer the control to statement labeled

[X এর মান যদি 5.5 অতিক্রম করে, তবে 33 দ্বারা সূচিত বাক্যে নিয়ন্ত্রণ বদল কর]

(ii) If the value of DISC is less than zero, then transfer the control to statement labeled 44; if DISC is greater or equal to zero, then transfer to statement labeled 44; [DISC এর মান যদি শূন্যের কম হয়, তবে 44 দ্বারা সূচিত বাক্যে নিয়ন্ত্রণ বদল কর; DISC যদি শূন্য অপরা অধিক হয় তবে 55 দ্বারা সূচিত বাক্যে বদল কর]

(iii) If $x > 5.5$ and $y < 1.2$, then increase the value of z by 1. [যদি $x > 5.5$ এবং $y <$ হয়, তবে z এর মান 1 বৃদ্ধি ধর]

(iv) If $1 \leq x \leq 2$ then set $k = 1$, otherwise set $k = 2$. [যদি $1 \leq x \leq 2$ হয়, তবে $k = 1$ ধর, $k = 2$ ধর]

Or, If $x \in [1, 2]$ then set $k = 1$, otherwise set $k = 2$.

[NUH-2003, 2009, NU(Pass)-2009, 2011, 2013, 2015]

(v) If $-1 < x \leq 1$ then set $M = 5$, or set $M = M + N$. [যদি $-1 < x \leq 1$ হয়, তবে $M = 5$ কর, $M = M + N$ কর]

Or, If $x \in (-1, 1)$ then set $M = 5$ or set $M = M + N$

Solution : (i) IF(X .GT. 5.5) GOTO 33 | Or, IF(X .GT. 5.5) THEN

GOTO 33

(ii) IF(DISC .LT. 0.0) THEN | ENDIF

GOTO 44 | Or, IF(DISC) 44, 55, 55

ELSE

GOTO 55

ENDIF

(iii) IF((X .GT. 5.5) .AND. (Y .LT. 1.2)) Z = Z + 1.0

Or, IF((X .GT. 5.5) .AND. (Y .LT. 1.2)) THEN

Z = Z + 1.0

ENDIF

(iv) IF((X .GE. 1.0) .AND. (X .LE. 2.0)) THEN

K = 1

ELSE

K = 2

ENDIF

(v) IF((X .GT. -1.0) .AND. (X .LE. 1.0)) THEN

M = 5

ELSE

M = M + N

ENDIF

1(i) IF(X .GE. 1.0)
 (X .LE. 2.0)

K = 1

ELSE

K = 2

ENDIF

(vii) $DISC = Y$
(viii) $Y = 3.0 * Y$
(ix) $IF(A.LT.0.0) M = M - 2$
Or, $IF(A .LT. 0.0) THEN$
 $M = M - 2$
ENDIF

Problem-9. Explain the following Fortran statements [নিম্নরূপ ফর্ট্রান স্টেটমেন্টস]

স্টেটমেন্টগুলো ব্যাখ্যা কর।

- (i) SEVEN = SEVEN + EIGHT
- (ii) SUM = SUM + TERM
- (iii) PROD = PROD * A(I)
- (iv) IF(P. GE. R), RESULT = P * Q
- (v) PROD = PROD * ELEMENT(I)
- (vi) IF(P. LE. Q) RESULT = 5.0 * P/Q
- (vii) STORE = STORE + GOODS
- (viii) IF(A. LE. B) ANSWER = 2.0 * B/A

[NUH-2004, 2017, NU(Pass)-2]

(ix) IF(DISC) 11, 22, 33

[NUH-2004, NU(Pass)-2]

(x) XX = XX + 1.0

[NU(Pre)-2]

(xi) X = X + Y

[NUH-20]

(xii) Fortran statements 'a = b' এবং 'b = a' ব্যাখ্যা কর।

(xiii) R = 25(25) 250 বলতে কি বুঝ?

Solution : (i) SEVEN = SEVEN + EIGHT

Here SEVEN and EIGHT are two different real variables and the value of variable SEVEN will be added with variable EIGHT, then the result will be stored in variable SEVEN. [এখানে SEVEN এবং EIGHT দুইটি ভিন্ন বাস্তব চলক, SEVEN চলকের মানের সাথে EIGHT চলকের মান যোগ করবে এবং ফলাফল SEVEN চলকে জমা রাখবে।]

i. e., $SEVEN \leftarrow SEVEN + EIGHT$

(ii) SUM = SUM + TERM

Here SUM and TERM are two different real variables and the value of variable SUM will be added with variable TERM, and then the result will be stored in variable SUM. [এখানে SUM এবং TERM দু'টি ভিন্ন real চলক, SUM চলকের মানের সাথে TERM চলকের মান যোগ করবে এবং ফলাফল SUM চলকে জমা হবে।]

i. e., $SUM \leftarrow SUM + TERM$

(iii) PROD = PROD * A(I)

Here A(I) is an array variable, for the fixed value of I, the value of real variable A(I) will be multiplied with the value of real variable PROD and result will be stored in variable PROD. [এখানে A(I) একটি এ্যারে Variable. I এর নির্দিষ্ট মানের জন্য A(I) চলকের মানের সঙ্গে গুণ হয়ে গুণফল PROD চলকের মধ্যে জমা করবে।]

i. e., $PROD \leftarrow PROD * A(I)$

(iv) IF(P. GE. R) RESULT = P * Q

Here P, Q, R and RESULT are four different real variables. If P is greater than or equal to R, then the multiplying value of P and Q will be stored in variable RESULT. [এখানে P, Q, R এবং RESULT চারটি ভিন্ন বাস্তব চলক, P যদি R এর চেয়ে বড় অথবা সমান হয় তবে P এবং Q চলকদ্বয়ের মানের গুণফল RESULT চলকে জমা করবে।]

i. e., $If P \geq R, RESULT \leftarrow P * Q$

(v) $\text{PROD} = \text{PROD} * \text{ELEMENT}(I)$

Here ELEMENT(I) is an array variable, for the fixed value of I, the value of variable ELEMENT(I) will be multiplied with the value of variable PROD and result will be stored in variable PROD. [এখানে ELEMENT(I) একটি প্রিয় Variable. I এর নির্দিষ্ট মূল্যের জন্য ELEMENT(I) চলকের মান, PROD চলকের মানের সঙ্গে গুণ হয়ে ফলফল PROD চলকের মধ্যে সংযোগ করবে।]

i. e., $\text{PROD} \leftarrow \text{PROD} * \text{ELEMENT}(I)$ (vi) $\text{IF}(P, \text{LE}, Q) \quad \text{RESULT} = 5.0 * P/Q$

Here P, Q and RESULT are three different real variables. If P is less than or equal to Q, then the dividing value of P and Q will be multiplied with 5.0 and the result will be stored in the RESULT variable. [এখানে P, Q এবং RESULT তিনটি ভিন্ন বাস্তব চলক, P যদি Q এর চেয়ে ছোট অথবা সমান হয় তবে P এবং Q ভাগফলের মানের সাথে 5.0 গুণ করে ফলফল RESULT চলকে সংযোগ করবে।]

i. e., $\text{IF } P \leq Q, \text{RESULT} \leftarrow 5.0 * P/Q$ (vii) $\text{STORE} = \text{STORE} + \text{GOODS}$

Here STORE and GOODS are two different variables and the value of variable STORE will be added with variable GOODS, then the result will be stored in variable STORE. [এখানে STORE এবং GOODS দুইটি ভিন্ন চলক, STORE চলকের মানের সাথে GOODS চলকের মূল্যের যোগ করবে এবং ফলফল STORE চলকে জমা রাখবে।]

i. e., $\text{STORE} \leftarrow \text{STORE} + \text{GOODS}$ (viii) $\text{IF}(A, \text{LE}, B) \quad \text{ANSWER} = 2.0 * B/A$

Here A, B and Answer are three different real variables. If A is less than or equal to B, then the dividing value of B and A will be multiplied with 2.0 and the result will be stored in the Answer variable. [এখানে A, B এবং Answer তিনটি ভিন্ন বাস্তব চলক, A যদি B এর চেয়ে ছোট অথবা সমান হয় তবে B এবং A ভাগফলের মানের সাথে 2.0 গুণ করে ফলফল Answer চলকে জমা করবে।]

i. e., $\text{IF } A \leq B, \text{ANSWER} \leftarrow 2.0 * B/A$ (ix) $\text{IF}(\text{Disc}) \quad 11, 22, 33$

Here Disc is an arithmetic expression, which is real variable.

(a) If the value of Disc is negative then the control will transfer with the statement labeled 11 and that statement is execute.

(b) If the value of Disc is zero then the control will transfer with the statement labeled 22 and that statement is execute.

(c) If the value of Disc is positive then the control will transfer with the statement labeled 33 and that statement is execute.

[এখানে Disc একটি arithmetic এক্সপ্রেশন, যেটি বাস্তব চলক।]

(a) যদি Disc এর মান ঋণাত্মক হয় তবে control 11 নাম্বারধারী স্টেটমেন্টে যাবে এবং উক্ত স্টেটমেন্টটি কার্যকরী হবে।

(b) যদি Disc এর মান শূন্য হয় তবে control 22 নাম্বারধারী স্টেটমেন্টে যাবে এবং উক্ত স্টেটমেন্টটি কার্যকরী হবে।

(c) যদি Disc এর মান ধনাত্মক হয় তবে control 33 নাম্বারধারী স্টেটমেন্টে যাবে এবং উক্ত স্টেটমেন্টটি কার্যকরী হবে।]

(x) $\text{XX} = \text{XX} + 1.0$

Here XX is a real variable, whose value will be added by 1.0 and then the result will be stored in variable XX [এখানে XX একটি চলক, যার মানের সাথে 1.0 যোগকরে ফলফল XX চলকে জমা করবে।]