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IDENTIFICATION

Floating Point Sine, Cosine, MU SIN4
704 FORTRAN II or SAP Program

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PURPOSE

To compute the floating point sine or cosine of a floating point angle $\theta/2\pi$, using fixed point arithmetic.

METHOD

With $\theta/2\pi$, in units of a circle, sin θ is computed from the adjusted Taylor series below, where adjustment of the coefficients has been made to give the best fit of a Tchebyscheff type.

$$\sin\theta = \frac{2\theta}{\pi}\left[a_{13}\left(\frac{2\theta}{\pi}\right)^{12} + a_{11}\left(\frac{2\theta}{\pi}\right)^{10} + a_9\left(\frac{2\theta}{\pi}\right)^{8} + a_7\left(\frac{2\theta}{\pi}\right)^{6} + a_5\left(\frac{2\theta}{\pi}\right)^{4} + a_3\left(\frac{2\theta}{\pi}\right)^{2} + a_1\right]$$

(cf. ILLIAC Subroutine Library-Program 157-T5)

SAP CALLING SEQUENCE

With $\theta/2\pi$ in the AC, sin θ is obtained in the AC by:

α	TSX SIN4, 4
$\alpha+1$	return

With $\theta/2\pi$ in the AC, COS θ is obtained in the AC by:

α	TSX COS4, 4
$\alpha+1$	return

FORTRAN CALLING SEQUENCE

Sin θ or Cos θ is obtained by use of the fortran expression

SIN4F ( ) or COS4F ( )

where the arguments in the parentheses above equal $\theta/2\pi$.

RANGE

$\theta/2\pi$ can be any floating point number. It is interpreted modulo 1 in the computation of sin θ.

CODING INFORMATION

MU SIN4 requires 70 words storage space.

```
MUSIN4 REM 0073 12159                                                  SIN4  0001
       REM SIN4              MURA FLOATING POINT SINE/COSINE           SIN4  0002
 COS4  FAD QUART                                                       SIN4  0003
  IN4  TZE 1,4                                                         SIN4  0004
       SXD IX,1                                                        SIN4  0005
       LRS 35                                                          SIN4  0006
       LLS 8                                                           SIN4  0007
       SSP                                                             SIN4  0008
       SUB H128                                                        SIN4  0009
       TMI *+4                                                         SIN4  0010
       STA *+1                                                         SIN4  0011
       LLS **                                                          SIN4  0012
       PXD 0,0                                                         SIN4  0013
       PAX 0,1                                                         SIN4  0014
       PXD 0,0                                                         SIN4  0015
       LLS 36,1                                                        SIN4  0016
       PBT                                                             SIN4  0017
 IX    TXI *+2,0,**                                                    SIN4  0018
       CHS                                                             SIN4  0019
       ALS 1                                                           SIN4  0020
       PBT                                                             SIN4  0021
       TRA *+2                                                         SIN4  0022
 PSE6  COM                                                             SIN4  0023
       LRS 1                                                           SIN4  0024
       RND                                                             SIN4  0025
       STO TEMPA                                                       SIN4  0026
       LDQ TEMPA                                                       SIN4  0027
       MPY TEMPA                                                       SIN4  0028
       LLS 2                                                           SIN4  0029
       RND                                                             SIN4  0030
       PBT                                                             SIN4  0031
       TRA *+2                                                         SIN4  0032
       COM                                                             SIN4  0033
       STO TEMPB                                                       SIN4  0034
       LXA PSE6,1                                                      SIN4  0035
       LDQ A13                                                         SIN4  0036
 MPR   MPR TEMPB                                                       SIN4  0037
       ADD A1+1,1                                                      SIN4  0038
       LRS 35                                                          SIN4  0039
       TIX MPR,1,1                                                     SIN4  0040
       MPY TEMPA                                                       SIN4  0041
       LXA PXD,1                                                       SIN4  0042
       LLS 1                                                           SIN4  0043
       PBT                                                             SIN4  0044
       TIX *-2,1,1                                                     SIN4  0045
       LRS 9                                                           SIN4  0046
       RND                                                             SIN4  0047
       TZE *+9                                                         SIN4  0048
       ANA MASK                                                        SIN4  0049
       TNZ *+2                                                         SIN4  0050
       CAL FIX                                                         SIN4  0051
       SLW TEMPB                                                       SIN4  0052
 PXD   PXD 130,1                                                       SIN4  0053
       ALS 9                                                           SIN4  0054
       ACL TEMPB                                                       SIN4  0055
       LLS 0                                                           SIN4  0056
       LXD IX,1                                                        SIN4  0057
       TRA 1,4                                                         SIN4  0058
 QUART OCT 177400000000     1/4                                        SIN4  0059
 CHAR  OCT 201000000000                                                SIN4  0060
```

```
MASK   OCT 000777777777                                    SIN4  0061
[illegible]X   OCT 001400000000                                    SIN4  0062
[illegible]13   OCT 000000001650                                    SIN4  0063
A11    OCT 400000170505                                    SIN4  0064
A9     OCT 000012407327                                    SIN4  0065
A7     OCT 400462645440                                    SIN4  0066
A5     OCT 012146570632                                    SIN4  0067
A3     OCT 522535716304                                    SIN4  0068
A1     OCT 311037552421                                    SIN4  0069
TEMPA  HTR **                                              SIN4  0070
TEMPB  HTR **                                              SIN4  0071
H128   HTR 128                                             SIN4  0072
       END COS4                                            SIN4  0073
```