Figure 1.21a

```
RUN NAME        TYPE 1 BALANCED INCOMPLETE BLOCK DESIGN.
COMMENT         DATA ARE TAKEN FROM COCHRAN & COX(1957).
VARIABLE LIST   REPLICS, TREATMNT, BLOCKS, DEP
INPUT MEDIUM    CARD
INPUT FORMAT    FIXED(3F1.0,F2.0)
N OF CASES      UNKNOWN
MANOVA          DEP BY REPLICS(1,5), TREATMNT(1,6), BLOCKS(1,3)/
                DESIGN = REPLICS, TREATMNT, BLOCKS W REPLICS/
                DESIGN = REPLICS, BLOCKS W REPLICS, TREATMNT/
READ INPUT DATA
111 7
12117
13226
14225
 ....
 ....
 ....
54326
55332
56127
END INPUT DATA
FINISH
```

The ANOVA tables from the output for Figure 1.21a are given in Figure 1.21b.

Figure 1.21b

TESTS OF SIGNIFICANCE FOR DEP USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. OF F
RESIDUAL	77.33333	10	7.73333		
CONSTANT	19712.03333	1	19712.03333	2548.96983	0.0
REPLICS	298.46667	4	74.61667	9.64871	.002
TREATMNT	1059.76667	5	211.95333	27.40776	.000
BLOCKS W REPLICS	213.40000	10	21.34000	2.75948	.062

TESTS OF SIGNIFICANCE FOR DEP USING SEQUENTIAL SUMS OF SQUARES

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. OF F
RESIDUAL	77.33333	10	7.73333		
CONSTANT	19712.03333	1	19712.03333	2548.96983	0.0
REPLICS	298.46667	4	74.61667	9.64871	.002
BLOCKS W REPLICS	753.00000	10	75.30000	9.73707	.001
TREATMNT	520.16667	5	104.03333	13.45259	.000

1.22 Partially Balanced Incomplete Block Designs (PBIB)

Because balanced incomplete block designs often require a large number of blocks, it may not be possible to find a design that fits the size of the experiment. A general class of BIB designs that do not have the uniform variances for treatment contrasts but still permit the estimation of treatment differences are the partially balanced incomplete block designs.

Consider the design in Table 1.22, with $t = 20$, $k = 4$, $r = 2$ and $b = 10$. Recall that for a BIB design any pair of treatments must appear together λ times. In this design, some treatments occur together in the same blocks and some do not. This is the main difference between BIB and PBIB designs.

Table 1.22

Blocks

1	2	3	4	5	6	7	8	9	10
A	M	E	Q	I	A	B	C	D	E
B	N	F	R	J	K	L	M	N	O
C	O	G	S	K	F	G	H	I	J
D	P	H	T	L	P	Q	R	S	T