

NATIONAL UNIVERSITY OF SINGAPORE

FACULTY OF SCIENCE

SEMESTER 2 EXAMINATION 2002-2003

GEK1518 Mathematics in Art and Architecture

April/May 2003— Time allowed: 2 hours

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Matriculation number:

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**Instructions to candidates**

1. This examination paper contains **four (4)** questions and comprises **nine (9)** printed pages.
2. Attempt to answer ALL questions. Answers should be written on this question paper.
3. Candidates may use calculators. However, they should lay out systematically the various steps in the calculations.

1. Draw the Archimedean tilings. [15 marks]

- a.  $(3^3.4^2)$
- b.  $(3^2.4.3.4)$
- c.  $(4.8^2)$
- d.  $(3.12^2)$
- e.  $(3.4.6.4)$
- f.  $(4.6.12)$
- g.  $(3.6.3.6)$
- h.  $(3^4.6)$  in both left and right versions.

a)

b)

c)

d)

e)

f)

g)

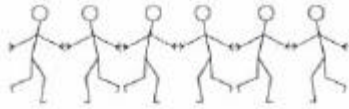
h)

2. Complete the table for the Platonic and Archimedean solids. [44 marks]

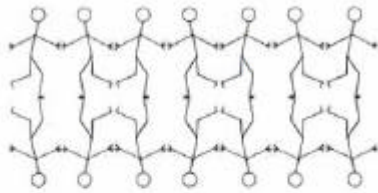
	Vertices	Edges	Faces	Shape of face	Degree of vertex
Tetrahedron					
Cube					
Octahedron					
Dodecahedron					
Icosahedron					
Truncated tetrahedron					
Truncated cube					
Truncated octahedron					
Truncated dodecahedron					
Truncated icosahedron					
Cuboctahedron					
Great rhombicuboctahedron					
Rhombicuboctahedron					
Icosidodecahedron					
Great rhombicosidodecahedron					
Rhombicosidodecahedron					
Snub cube					
Snub dodecahedron					

3. Use the chart in Attachment 1 to determine the symmetry type of the frieze patterns below. [7 marks]

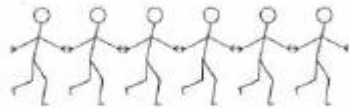
(a)



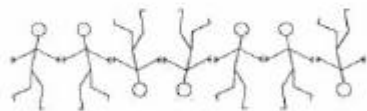
(b)



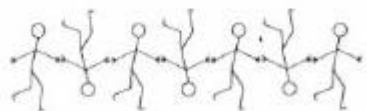
(c)



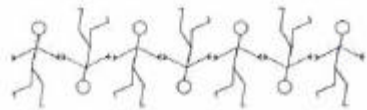
(d)



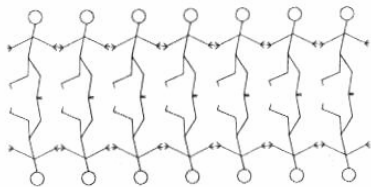
(e)



(f)



(g)



4. Use the chart in Attachment 2 to determine the symmetry type of the wallpaper patterns below. [34 marks]

a.

b.

c.

d.

e.

f.

g.

h.

i.

j.

k.

l.

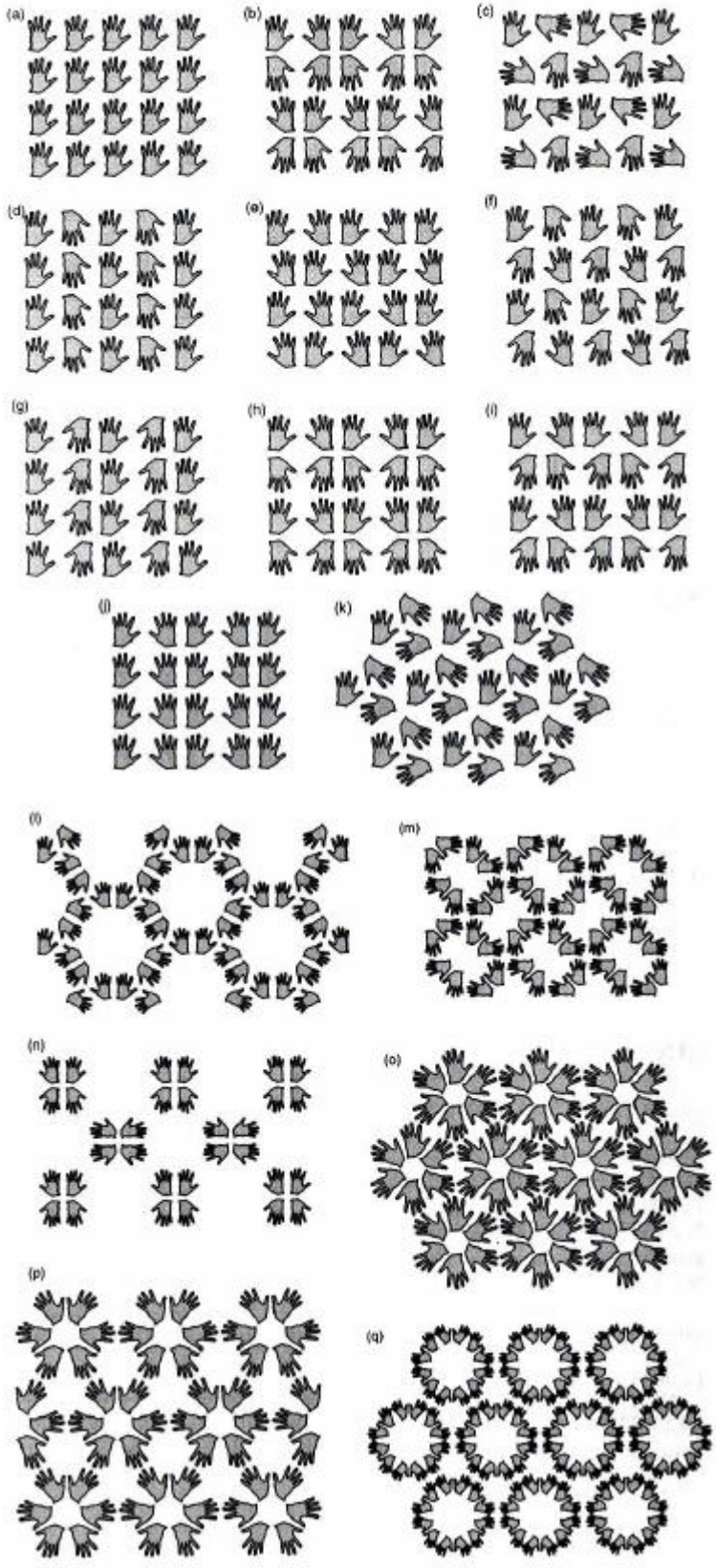
m.

n.

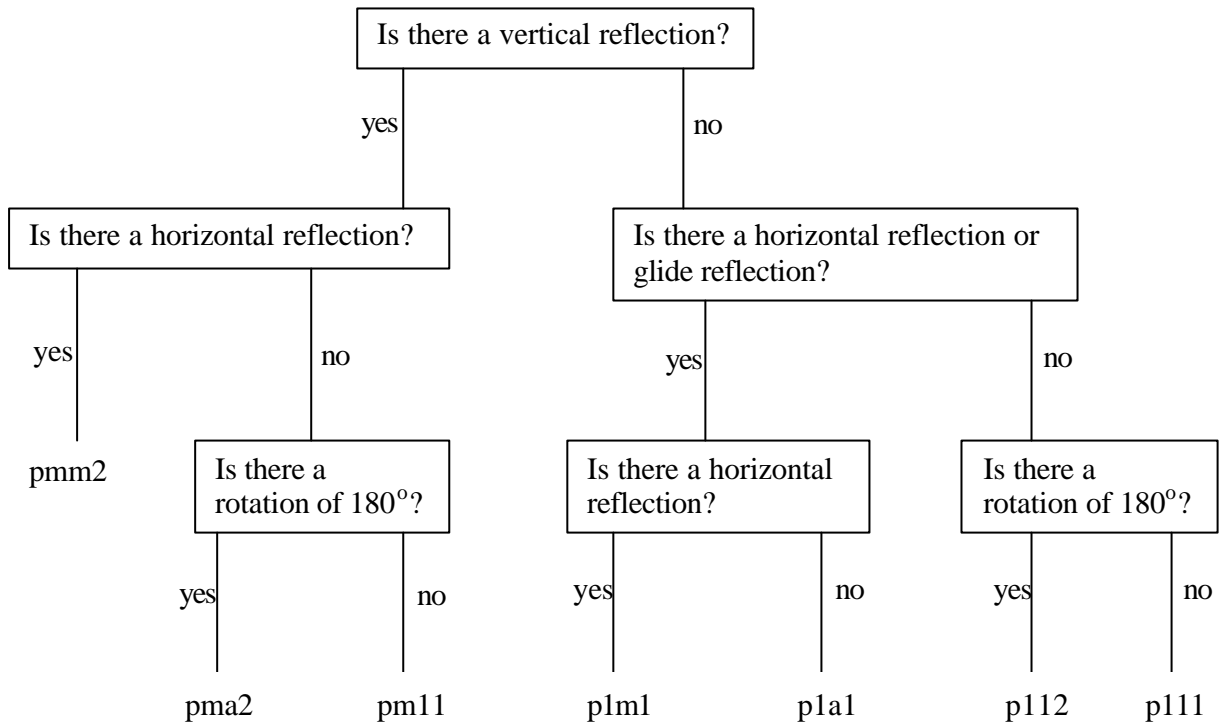
o.

p.

q.



Attachment 1: Flow chart for frieze patterns.





Attachment 2: Flow chart for wallpaper patterns.

