

**The University of Melbourne
Semester Two
2004**

Faculty of Architecture, Building and Planning

Subject Number: 702819
Subject Title: Science and Services (PG)
Reading Time: 15 minutes
Exam Duration: 2 hours
This paper has 3 pages

Authorised Materials:

Normal writing materials only are authorised

Instructions to Invigilators:

This examination paper is for distribution to Architecture and Property and Construction students enrolled in the subject 702219 Science and Services.

Each student will need to be given at least 2 examination booklets

The examination paper may NOT be removed from the examination room at the completion of the examination period

Instructions to Students:

- Answer all questions on this examination paper.
- Fill in your student number at the top of the page.
- **Complete each section (SCIENCE and SERVICES) in a separate examination booklet.**
- Allow 60 minutes writing time for each section.
- **SCIENCE section: 5 questions = 50 marks total**
- **SERVICES section: 5 questions = 50 marks total**
- This exam forms 70% of your final assessment in this subject.

All written responses should be concise and to the point.

Annotated diagrams should be used to support written responses.

Paper to be held by the Baillieu Library.

SCIENCE SECTION: 5 Questions – 50 marks total

Answer all questions in this section in the examination booklet(s) provided

1 CLIMATE

10 MARKS

Part a: Describe the basic differences between sun paths at tropical and temperate climate zones, and explain how this affects the design of sunshading devices in each of these zones. (6 marks)

Part b: Give an example of a building that could be described as 'climate responsive', including a description of its basic features: (4 marks)

2 SOLAR GEOMETRY

10 MARKS

Part a: Draw a section through a North facing window located in Melbourne (Latitude $37\frac{1}{2}^{\circ}$ South) showing an 'ideal' shading device, indicating sun angles for 12 noon (solar time) for both Summer and Winter solstice. (4marks)

Part b: Calculate the angles for a similar shading device in Beijing, China (Latitude 40° North) and state which direction it should face. (3 marks)

Part c: The Arctic Circle and the Tropic of Cancer define the boundaries of the temperate zone in the Northern Hemisphere. Sketch the solar chart for each of these locations showing the altitude angle at noon solar time for summer and winter solstice. (3 marks)

3 THERMAL PERFORMANCE

10 MARKS

Part a: Describe ways in which passive design features can assist in keeping a house cool in summer and warm in winter. (3 marks)

Part b: Explain how the choice of construction type affects the cost of running a heating appliance, and describe how this is currently influenced by legislation in Victoria. (4 marks)

Part c: Explain the factors that affect thermal comfort for building occupants, and how this might affect the choice of heating or cooling appliances. (3 marks)

4 DAYLIGHT

10 MARKS

Part a: With reference to recommended lighting levels from Australia Standard 1680, describe a suitable lighting level for a room in which the main activity is reading and writing. (2 marks)

Part b: For a building in Melbourne, describe a suitable daylight factor (DF) that would be used to provide the lighting level above, taking account of the reliability of daylight as a light source (4 marks)

Part c: Describe ways in which office space can be designed to ensure good daylight access for all workers. (4 marks)

5 ARTIFICIAL LIGHT

10 MARKS

Part a: Describe the basic functions of lamps and luminaires, and give an example of each. (3 marks)

Part b: Describe a method used to calculate the number of luminaires to be installed in a space, and then explain what other factors need to be considered to determine where the luminaires should be located. (4 marks)

Part c: Describe a situation in which glare might occur with artificial lighting, and explain how it can be prevented. (3 marks)

SERVICES SECTION: 5 Questions – 50 marks total

Answer all questions in this section in the examination booklet(s) provided

- 1 HEATING 10 MARKS**
Hydronic systems are often recommended as the most effective for domestic heating in Melbourne. By making comparisons with other heating types, explain why a hydronic system might be the most appropriate, and explain a situation in which a hydronic system would not be suitable.
- 2 FIRE CONTROL 10 MARKS**
Describe the fundamental principles informing the design of fire control systems in buildings. For each principle, give one example of a device or system that might be installed or built into a building.
- 3 PLUMBING AND DRAINAGE 10 MARKS**
Part a: Describe the basic performance requirements for domestic water supply, and give an example of how each of these might be satisfied. (5 marks)

Part b: Describe the basic performance requirements for domestic sanitary drainage systems, and give an example of how each of these might be satisfied. (5 marks)
- 4 HOT WATER 10 MARKS**
Part a: Describe the basic options available for domestic hot water systems, and explain the advantages of each. (6 marks)
Part b: The Victorian Government is currently offering Rebate and Certificate schemes to encourage home owners to install Solar Hot Water systems. Explain why financial incentives are necessary to encourage the use of this particular type of water heater. (4 marks)
- 5 REMOTE SYSTEMS 10 MARKS**
Describe the principles associated with on site water collection and waste disposal for domestic use, including a brief description of a suitable system for each.

END OF EXAMINATION