

THE UNIVERSITY OF MELBOURNE
FACULTY OF LAND AND FOOD RESOURCES
DOOKIE CAMPUS

202 – 308 IRRIGATION AND WATER MANAGEMENT

November 26, 2004

9.00 am – 12 noon
Duration: 3 hours
No. of marks: 150

1. The Living Murray initiative aims to provide 500 GL of water annually to improve river health at key points in the river system. List and describe the ways these volumes of water could be won from current water resource systems in the Murray Darling Basin.
(10 marks)

2. In the production of a crop, a grower applies 12 ML/ha of water to the crop which occupies 2 ha of land. If the crop utilizes 900 mm of water, what would be the depth and volume of groundwater accession assuming no runoff?
(5 marks)

3. As a strategy for drainage control, an irrigator employs re-use water to irrigate a tree crop. If 10 ML/ha per annum of water containing 2,000 mg/l of salt is applied:
 - (a) What tonnage of salt is applied?
 - (b) Assuming 10% leaching fraction, what volume of drainage water would accrue?
 - (c) What would be the salinity of the drainage water?

(10 marks)

4. The water budget details provided apply to a wet year at a site in north-eastern Victoria. The crop is Lucerne. Using this information you are required to:

- (a) estimate the demand for irrigation water and express it in ML/ha assuming that soil moisture storage is minimal.
- (b) estimate the potential groundwater accession assuming that there is no winter runoff from the site.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Average rainfall (Monthly mm)	33	8	18	122	138	86	67	31	97	19	21	30	670
Average monthly evapo transpiration (mm)	195	171	128	71	36	19	23	39	56	91	124	168	1121

(10 marks)

5. List and describe two techniques for scheduling irrigation water applications either through soil moisture measurement or monitoring weather conditions and climate.

(10 marks)

6. An orchard is located on a sandy loam in a district where the average February evapotranspiration is 170 mm. The field capacity of the soil is 1.4 mm/cm (140 mm/metre). Permanent wilting point occurs when the average moisture content of the soil falls to 0.5 mm/cm (50 mm/metre). The effective root zone depth is 1 metre.

You are required to determine:

- (a) the ideal interval between irrigations
- (b) the crop water requirement to be satisfied by either irrigation or rainfall
- (c) the irrigation application assuming 80% efficiency

(10 marks)

7. The following results were obtained from a laboratory soil testing program.

Weight of wet soil sample before irrigation – 172 g

Weight of soil sample after oven drying – 146 g

Soil density 2400 kg/m^3 (Volume Weight 1.4)

Field capacity – 20%

What amount of water must be applied to irrigate the soil profile to the root zone depth of 1.0m?

(10 marks)

8. What are the key water management issues currently being tackled by the Murray Darling Basin Commission?

(10 marks)

9. Describe the mechanism of dryland salinity and explain how this form of salinity can be controlled.

(10 marks)

10. (a) What is blue green algae?
(c) What environmental factors favour the growth of blue green algae?
(d) What strategies are being adopted to control blue green algae blooms?

(10 marks)

11. What are the key water quality parameters of concern for determining the value of a water resource for:

(a) Irrigation purposes? 4 marks)

(b) Domestic purposes? (6 marks)

12. One of the major initiatives of water resource management in Victoria is enhanced protection of wetlands. Why do catchment management authorities and water authorities place so much emphasis on the value of wetlands?

(10 marks)

13. What are the advantages and disadvantages of trickle/microsprinkler irrigation compared with furrow or border check flood irrigation?

(10 marks)

14. An irrigator obtains a flow of 12 ML/day through an outlet. This is used to irrigate a border check irrigation system with bays 500 metres long and 60 metres wide to a depth of 100 mm. The application efficiency of the system is 70%

- (a) What volume of water will be required to water each bay?
(b) How long will the watering of each take?

(5 marks)

15. What strategies are being followed for the control of elevated water tables in the Goulburn Broken region?

(10 marks)

16. What are the key parameters which need to be determined in the prediction of open channel velocities and flow rate?

(5 marks)

17. If the head loss through 250m of 150 mm diameter pipe discharging 10 litres per second is 1.5 m, what head loss would occur in 500 m of the same type of pipe which is of 100 mm diameter, discharging 5 litres/second.

(5 marks)

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