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CHAPTER 1

Solutions for Review Questions

Question	Answer
1	C
2	E
3	A
4	A
5	D
6	A
7	B
8	B

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1-1

On a small forested lot, interception would be important for small storms. Forested areas also have greater potential for infiltration (i.e., soil storage) than urban areas. The surface runoff and channel processes would be relatively unimportant.

1-2

For the forested condition, infiltration and interception are the primary processes. In a cleared-watershed state, overland flow will be a dominant hydrologic process. The influence of infiltration will be much less than for either the forested or developed states. After the residences have been built, roadway and pipe drainage will be more important. Grass-covered areas will have some infiltration potential.

1-3

For the portion of the watershed devoted to the shopping center, rooftop and parking lot runoff will be the most important processes. Depression storage will be a minor factor. Infiltration and interception will not be important.

1-4

If the shopping center is in the upper portion of the watershed, then the runoff from developed portion of the watershed will be partially smoothed by the rural land cover. Thus, the hydrologic effect of the shopping center would be minimized. If the shopping center is near the outlet of the 500-ac watershed, the runoff from the shopping center will pass out of the watershed before the runoff arrives from the rural portion of the watershed. Thus, the shopping center will only have a minor effect on the characteristics of the flood runoff.

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1-5

The runoff will be dominated by the surface runoff from the paved surfaces. The cross-slope of the highway will direct runoff to the shoulder. If the shoulder is bordered by a curb, then the runoff will collect in the gutter and flow to the nearest inlet. Flow from the grassed right-of-way will have a minor impact on the total flow.

1-6

Generally, where basements are wet, topography directs runoff towards the house. There it is trapped by the house and infiltrates into the ground. The cracks in the basement floor are the easiest path for the water to take. One possible solution is to grade the surface area around the house so that the water drains away from the house.

1-7

The erosion is the result of the high-velocity surface runoff. The greater the land slope, the higher the rate of the erosion. To reduce the erosion potential, the land could be graded to reduce the slope along the flow path. The flow path should be graded in a meandering pattern and seeded with vegetation that would increase the roughness of the flow path.

1-8

In the analysis case, an experiment would be designed where the headloss and velocity could be measured for given values of the length and diameter. Then f can be computed, and the roughness is estimated from the Moody diagram.

In the synthesis case, f would be obtained from the Moody diagram and be used to compute the headloss.

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1-9

The pump equation is $P_o = \gamma QH/e$ where P_o = power output, γ = specific weight of the fluid, Q = flow rate, H = the total head, and e = efficiency. The efficiency could be estimated by measuring the flow rate and the power output for a given head. In the synthesis case, the efficiency will be indicate on the pump, while Q and H can be measured.

1-10

$$V_p = 1\text{ in. } (25\text{ ac})\left(\frac{1\,ft}{12\,in.}\right) = 2.083\text{ ac-ft}$$

$$= 2.083\text{ ac-ft}\left(\frac{43560\,ft^2}{1\,ac}\right) = 90{,}750\text{ ft}^3$$

depth = V_p/A_s = 90,750/25,000 = 3.63 ft

1-11

$$V_p = 9\,in.\,(200\,mi^2)\left(\frac{1\,ft}{12\,in.}\right)\left(\frac{43560\,ft^2}{ac}\right) = 235950\,P_i$$

$V_s = 0.2\ V_p$ = 19,200 ac-ft

1-12

$$P = P_i(65\,ac)\left(\frac{1\,ft}{12\,in.}\right)\left(\frac{43560\,ft^2}{ac}\right) = 235{,}950\,P_i\,[=]\text{ ft}^3$$

$$R = R_i(10\text{ min})\left(\frac{60\text{ sec}}{\text{min}}\right) = 600\,R_i\ [=]\text{ ft}^3$$

t	P_i	P	R_i	R	P - R	∑(P - R)
10	0.07	16517	2.1	1260	15257	15257
20	0.15	35392	9.5	5700	29692	46209
30	0.21	49550	18.9	11340	38210	84419
40	0.16	37752	37.3	22380	15372	99791
50	0.09	21234	48.8	29280	-8044	91746
60	0.05	11798	52.6	31560	-19762	71984

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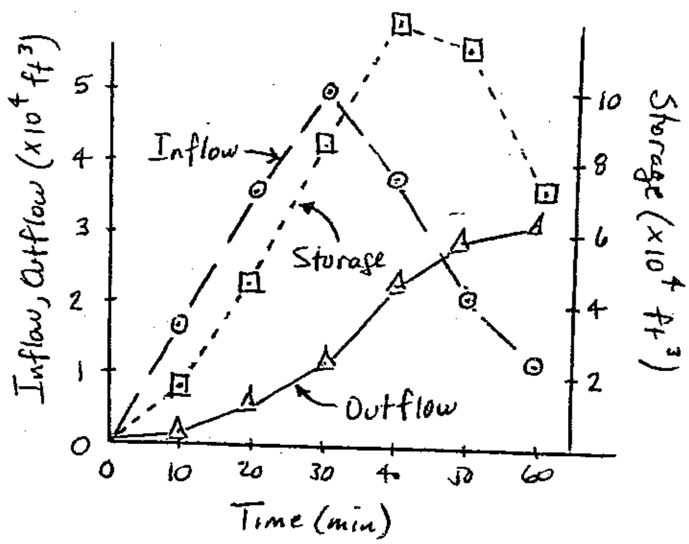

The storage increases as long as the inflow is greater than the outflow. Maximum storage occurs just prior to the point in time when outflow exceeds inflow.

1-13

(1) Before a hydrologist makes an analysis or design, he or she should have both the educational background and the experience necessary to competently perform the work. As an example, the hydrologist should know the limitations of a model, the basis on which the design model was developed, and constraints on its application. A professional would not accept the assignment if he or she lacked the proper education or experience.

(2) A hydrologist has responsibilities and obligations to his or her employer and to the client. The professional also has responsibilities to society. These responsibilities must be balanced where they conflict.

(3) Professionals have obligations to the employer, the client, the profession, and society. These obligations must be balanced. Many responsibilities involve human and societal values, not just technical concerns. Standards of conduct, such as codes of ethics, outline these value issues and address the way that a professional should approach them.

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(4) Registration, such as a professional engineer licence, is important to ensure that only those who have the proper education and experience practice in the field. It discourages unqualified people from performing the specific responsibilities of the professional and possibly damaging the reputation of those in the profession who are qualified.

(5) A person who fails to recognize the obligations that he or she has to the profession is more likely to be swayed by selfish motives. Thus, support of the profession encourages altruistic practice (while not ignoring legitimate responsibilities to oneself).

(6) Confidentiality is an important character trait of a professional. It reflects one's recognition of the responsibilities that a professional has.

1-14

The technical basis of hydrologic analysis and design is not static. New knowledge arises just as new problems arise. In order for a hydrologist to be capable of solving these new problems, he or she must continue to educate him or herself. Failure to maintain competency will put the firm at a disadvantage. It also means that a client is not getting the best possible analysis or design. Failure to maintain competency may lead to projects that are not the safest possible or the most aesthetically pleasing.

A professional can maintain competency by taking classes at a local university, attending professional workshops/short courses, reading professional journals, attending conferences where papers are presented, and pursuing self-study activities.

1-15

beauty/aesthetics: Projects should not aesthetically degrade the local environment. Including vegetation around a storm detention basin will keep the basin from degrading the community.

diligence: A professional must be diligent so projects are completed on time, which will prevent delays of project implementation.

efficiency: A professional has a responsibility to both an employer and the client to be efficient in completing work.

honor: A professional must honor the profession; this encourages competent professional practice.

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knowledge:	Lack of sufficient knowledge can prevent a professional from providing the client with the best project.
loyalty:	A professional should be loyal to the company as long as it does not prevent him or her from meeting his or her responsibilities to the client or society.
public health/safety:	Professional projects should he completed in a way that they do not put public health or safety at unnecessary risk.
respect:	A professional must respect the environment. A professional must respect obligation to the employer, the client, the profession, and society.
truth:	The professional must be truthful in all activities, both in personal and professional matters.

1-16

This is a conflict between the values of truth, honesty, and efficiency on one side of the dilemma and happiness and security on the other side. The individual or firm may do this to provide personal happiness in getting the contract as well as providing (job) security for the employees. But the individual is not being totally honest with the client and will reduce the efficiency of the clients' work activities. In this case, the selfish motives are less important that truthfulness and efficiency, so greater weight should be given to the values of honesty and efficiency.

1-17

Assuming that the computer is being used for personal gain or pleasure and against company policy, then the hydrologist is not being honest with the employer. The activity may also reduce the efficiency of the firm. The individual is placing personal happiness and (financial) security above the responsibilities that he or she has to the firm. While obligations to a company do not always outweigh obligations to oneself, in this case, truthfulness should be given more weight than the selfish motives.

1-18

Probably the single most common reason for professionals having their licence revoked is because of failing to properly supervise their subordinates.

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The values involved are honesty (where someone signs a design, it indicates that they have complete knowledge of the work), respect (for the registration process), and public safety (assuming a failed project would potentially have public consequences) versus efficiency (the reason that an engineer would do this is to increase his or her own efficiency in a time-management sense). In this case, public safety and respect should be given more weight than efficiency.

1-19

This is an issue where variations must be acknowledged. For example, some might agree that this is not an ethical problem if the papers are submitted to journals where the audiences of the two journals are completely different, for example, a paper addressing communication issues submitted to a journal read by English professors and another journal read entirely by engineers. The issue becomes more problematic as the two fields come closer to each other. For example, a paper that develop a new statistical test and applies it to engineering data is sent to both a journal of statistical methods and a journal of engineering applications.

The basic value dilemma is a lack of truthfulness and efficiency vs. personal pleasure (professional benefit). The individual should be honest with both editors and let them know that the paper is being submitted to the other journal. It should also be noted on one's resume that it is the same paper in order to prevent a reviewer of the resume from believing that the person has accomplished more than he or she really has. The practice of submitting the paper to similar journals reduces the efficiency of the journals and can be a misuse of the resources of the publisher of the journal.

1-20

The basic issue here is equality. The office manager is not providing equal opportunity for the two subordinates. Putting aside the legal aspects to concentrate on the value issues, the office manager cannot cite any value that would justify the action. Suggesting freedom as a basis ignores the freedom that the woman should be accorded in meeting her personal responsibilities and for professional growth.

1-21

This situation is very value oriented. The professor will point to the knowledge that she will gain from the real-world consulting, her freedom to make the most of her abilities, her happiness, and the security provided by the outside consulting. Conversely legitimate arguments could be made

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that her absence from the university environment hinders her students' ability to gain knowledge; thus, knowledge is a value that supports both sides of the conflict. Loyalty to and respect for the goals of the university are other values that arise on the side of the university/ students. Honesty and truth may be other values that the professor is violating. If the university has a one-day-a-week policy that the professor is exceeding, then she is not being honest in her dealings with the university.

The university recognizes the importance of the knowledge gained by professor's outside consulting, but they also recognize the detrimental impact of faculty exceeding the one-day limit. Thus, the university has established the one-day-a-week policy as a weighting of the values.

1-22

The hydrologist shows concern for his personal security (increased number of jobs) and his own happiness (ego boost from acting as a ground-water specialist). He evidently values this more than honesty, truth, and the potential damage to public health/safety that could result if he misapplies the program. He attaches more weight to the personal values than to the professional values.

1-23

For 1-17: "This is a common practice." This rationalization is made because the manager then feels that he is no worse than anyone else.

For 1-18: "The computer does not suffer from use."

For 1-19: "I can't do everything and the work is not difficult."

For 1-20: The audiences of the two journals are very different."

For 1-21: "The assignments given to the woman are comparable to those given to the man."

For 1-22: "My students will benefit from the knowledge that I gain."

For 1-23: "I am a hydrologist and this [the ground-water problem] is a problem in hydrology.

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1-24

1. "Everybody does it." That doesn't mean that it is not dishonest. It is also not true because many do not cheat.

2. "It's the professor's responsibility to keep us from cheating." When someone puts his or her name on the paper, that indicates that it is his or her work, not someone else's work. It is not justified if the professor fails to detect the cheating.

3. "I am not hurting anyone." When grades are curved, cheating can hurt someone else's grade. Also, it contributes to an unprofessional environment.

1-25

Studies have shown that students who cheat in high school are more likely to cheat in college than those who do not cheat in high school. It is unlikely that any studies have been made about the correlation between cheating in college and in professional life. However, the propensity to cheat depends on a person's value system and unless the person's value system changes significantly upon graduation, which is very unlikely, then the person will be making value decisions in professional life with the same value system that allowed cheating in college.

1-26

While an individual may be ethical, that does not necessarily mean that (1) they will not come in contact with people who are not ethical and (2) that they will know how to handle an ethical dilemma in the way that the profession expects them to respond. Someone who has been involved in discussions of professional conduct may be more capable of properly responding to an ethical dilemma that someone who lacks the knowledge and experience.

1-27

The advisor may be guilty of plagiarism because he or she used someone's work without proper recognition. Even if the advisor had referenced the thesis, the advisor may still be guilty because the reference is an inadequate measure of recognition. The advisor may rationalize his or her action by indicating that it was his or her idea and that he or she didn't use any material word-for-word from the thesis.

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The student should review the published paper and identify material that was specifically addressed in the thesis. Then she should contact the advisor for an explanation. If still not satisfied, she should notify the department chairperson and ask for an internal review of the matter. If still not satisfied, she can take it through the proper channels within the university. If she still believes that the matter was not handled properly by the university, she should contact the editor of the journal where the research was published. Obviously, this can take a long period of time.

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CHAPTER 2

Solutions for Review Questions

Question	Answer
1	D
2	E
3	E
4	B
5	A
6	A
7	B
8	C
9	B
10	D
11	A
12	C
13	B
14	D
15	D
16	A
17	C
18	A
19	C
20	E
21	B
22	B

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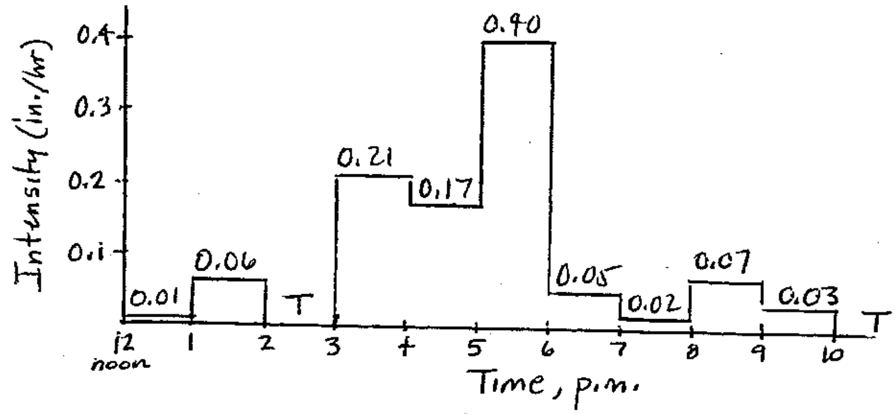
2-1



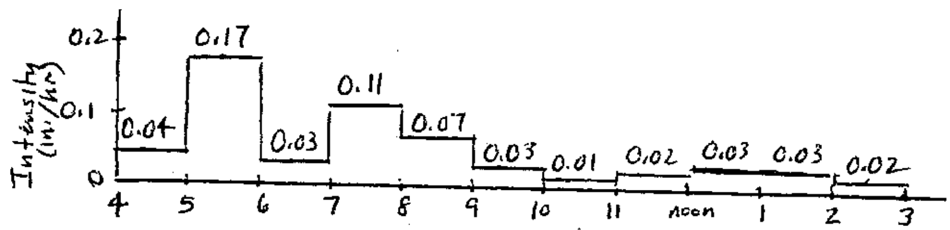
Total depth = (0.01 + 0.06 + 0.21 + 0.17 + 0.40 + 0.05 + 0.02 + 0.07 + 0.03)
= 1.02 inches

Maximum hourly rate = 0.40 in./hr.

Maximum 2-hr. rate = (0.40 + 0.17) in./2 hr. = 0.285 in./hr.

$$\text{Volume} = 10\ \text{mi}^2 * \frac{640\ ac}{mi^2} * 1.02\ in. * \frac{ft}{12\ in.} = 544\ ac\text{-}ft$$

2-2



Total depth = (0.04 + 0.17 + 0.03 + 0.11 + 0.07 + 0.03 + 0.01 + 0.02 + 0.03 + 0.03 + 0.02)
= 0.57 in.

Maximum hourly rate = 0.17 in./hr.

Maximum 3-hr. rate = (0.17 + 0.03 + 0.11) in./hr./3 hr. = 0.103 in./hr.

$$\text{Volume} = 50\ \text{ac} * 0.57\ \text{in.} * \frac{1\ ft}{12\ in.} = 2.375\ ac\text{-}ft$$

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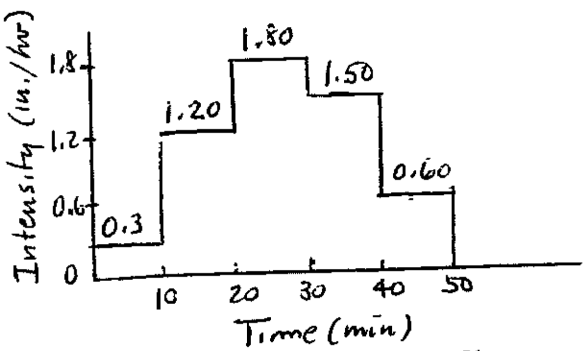
2-3

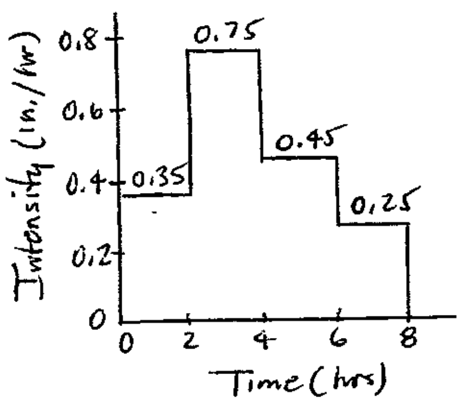


To convert the depths to intensities, divide by the interval and include conversion factors; for example, (0.05 in./10 min.) * (60 min./hr.) = 0.30 in./hr.
The maximum 30-min. intensity occurs during the middle three ordinates:

d_{30} = (0.20 + 0.30 + 0.25) in. = 0.75 in.

$$i_{30} = \frac{0.75\ in.}{30\ \min.} * \frac{60\ \min.}{hr.} = 1.5\ in./hr.$$

2-4



To convert the depths to intensities, divide the depths by the time interval; for example, 0.7 in./2 hr. = 0.35 in./hr.
The maximum 4-hour intensity is: $\frac{(1.5 + 0.9)\ in.}{4\ hours} = 0.60\ in./hr.$

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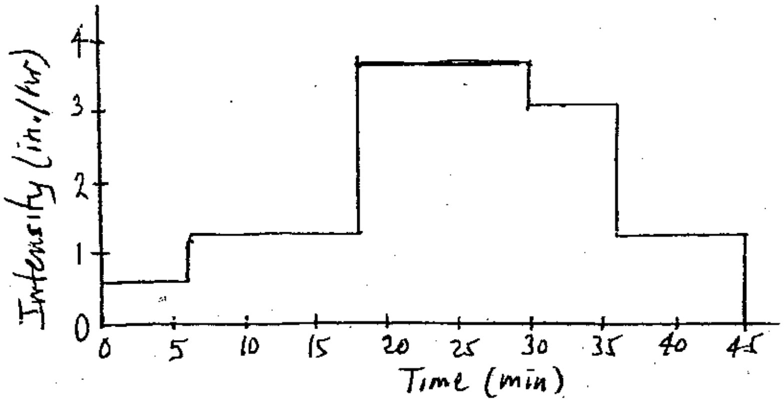
2-5



Total depth = 0.06 + 0.24 + 0.18 + 0.54 + 0.30 + 0.18 = 1.5 inches
Maximum intensity = 3.6 in./hr.

2-6

(a) $\frac{1.5\ in.}{30\ \min.} * \frac{60\ \min.}{hr.} = 3\ \frac{in.}{hr.}$

(b) $\frac{45\ ac\text{-}ft}{40\ \min.} * \frac{60\ \min.}{hr.} * \frac{12\ in.}{ft} * \frac{1}{0.5\ mi^2} * \frac{1\ mi^2}{640\ ac} = 2.53\ \frac{in.}{hr.}$

2-7

(a) $3\ in. * 0.25\ mi^2 * \frac{ft}{12\ in.} * \frac{640\ ac}{1\ mi^2} = 40\ ac\text{-}ft$

(b) $0.6\ \frac{in.}{hr.} * 90\ \min. * \frac{hr.}{60\ \min.} * \frac{ft}{12\ in.} * 10\ ac = 0.75\ ac\text{-}ft$

(c) $0.9\ in. * 1\ mi^2 * \frac{640\ ac}{mi^2} * \frac{ft}{12\ in.} = 48\ ac\text{-}ft$

2-8

(a)

City	Depth (in.)	Intensity (in./hr.)
New York	2.45	1.225
Atlanta	3.25	1.625
Chicago	2.40	1.20
Dallas	3.75	1.875
Denver	1.65	0.825
Seattle	0.70	0.35

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