2020

RANK Improvement WORKBOOK

Answer key and Hint of Objective & Conventional *Questions*

Civil Engineering

Engineering Hydrology

MADE EASY Publications

1 Precipitation and General Aspects of Hydrology

LEVEL 1 Objective Solutions

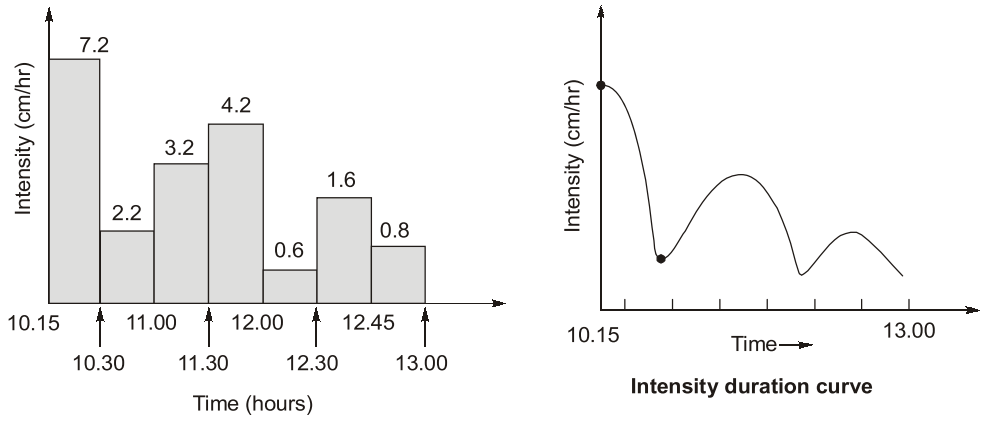
1. (d)
2. (b)
3. (c)
4. (a)
5. (d)
6. (b)
7. (a)
8. (d)
9. (c)
10. (d)
11. (a)
12. (c)
13. (b)
14. (c)
15. (b)

LEVEL 2 Objective Questions

16. (287.375)
17. (c)
18. (b)
19. (d)
20. (a)
21. (b)
22. (c)
23. (b)
24. (b)
25. (b)
26. (c)
27. (d)
28. (d)
29. (b)
30. (a)

LEVEL 3 Conventional Questions

Solution : 2



Solution : 3

Stations *A*, *C*, *D*, *F* should be chosen for installing one raingauge each.

Solution : 5

(i) Minimum storage capacity required to meet the demand without any spilling = 40.08×10^5 m^3

(ii) Minimum initial storage in the reservoir should be 19.82×10^5 m^3.

Solution : 6

Mean rainfall over the circular basin = 100 cm

Solution : 8

Precipitation at X = 2671 mm

Solution : 10

Rate of evaporation = 4.25 mm/h/m^2

Solution : 11

Water surface elevation at the end of the month = 103.200 +0.058 = 103.258 m above the datum

Solution : 12

For the entire catchment,

$r = (1105 - 532)/1105 = 0.518$

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2 Evaporation, Transpiration and Stream Flow Measurement

LEVEL 1 Objective Questions

1. (b)
2. (b)
3. (d)
4. (d)
5. (c)
6. (c)
7. (b)
8. (b)
9. (d)
10. (b)
11. (c)
12. (c)
13. (d)
14. (b)

LEVEL 2 Objective Questions

15. (a)
16. (d)
17. (d)
18. (d)
19. (b)
20. (c)
21. (c)
22. (b)
23. (c)
24. (c)
25. (b)
26. (c)
27. (c)
28. (b)
29. (a)

LEVEL 3 Conventional Questions

Solution : 1

The minimum storage capacity needed to maintain uniform demand is 15.936 million cubic meters.

Solution : 3

Discharge, $Q = 81.07\ m^3/sec$

Solution : 4

Correlation betwen R and P

$$R = 0.43P - 1.93$$

Solution : 5

Total discharge, $Q = 58.056\ m^3/sec$

Solution : 6

Monthly evaporation loss $= 7.724 \times 10^6\ m^3 = 7.724$ million m^3

Solution : 8

ϕ-index of the storm is 0.42 cm/h and the duration of rainfall excess, t_e is 10 hours

Solution : 9

$$\frac{\bar{V}}{V_{0.6}} = 1.001$$

Solution : 10

Mixing length, L = 10975 m

Solution : 11

1. The required gauge-discharge relationship is
$$Q = 159.44\,(G - a)^{1.371}$$
2. By equation coefficient of correlation = 0.938
3. Discharge corresponding to stage values of 42.50 m and 48.50 m are 2525 m^3/s and 5368 m^3/s respectively.

Solution : 12

Actual discharge, $Q_m = 164.4\ m^3/s$

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3 Infiltration, Runoff and Hydrographs

LEVEL 1 Objective Questions

1. (c)
2. (d)
3. (60)
4. (c)
5. (d)
6. (c)
7. (c)
8. (a)
9. (b)
10. (b)
11. (b)
12. (b)
13. (c)
14. (b)
15. (d)
16. (c)

LEVEL 2 Objective Questions

17. (b)
18. (c)
19. (22)
20. (60)
21. (c)
22. (b)
23. (c)
24. (d)
25. (d)
26. (c)
27. (b)
28. (a)
29. (b)
30. (b)
31. (b)

LEVEL 3 Conventional Questions

Solution : 4

Attenuation in peak flow discharge = 110.87 m^3/s.

The outflow hydrograph has a peak value at t = 36 hrs.

Solution : 5

(i) Channel storage after one hour = 4800 m^3

(ii) Maximum storate = 96000 m^3

Maximum stroate occurs at t = 20 hr.

Solution : 7

(a) Runoff volume over the catchment = 22365 m^3

(b) Total runoff volume over the catchment,

$$V_r = 350 \times 10^4 \times 18.66 / (1000) = 65310\ m^3$$

Solution : 8

The required annual rainfall – runoff relationship of the catchment is given by

$$R = 0.4828\ P - 0.2535$$ with both and R being in cm and $R \geq 0$.

when P = 15.50 cm, R = 7.23 cm = 5.061 Mm^3

Solution : 9

[16.74 Mm^3; 1.41 Mm^3/day; Nil]

Minimum storage required = 16.74 MCM

Solution : 11

Volume of 1-h UH = 716 (m^3/s, hour) = 716 × 3600 m^3

If A = Area of catchment in km^2, $A \times 10^6 \times (1/100) = 716 \times 3600$

$$A = 257.76\ km^2$$

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4 Floods, Flood Routing and Flood Control

LEVEL 1 Objective Questions

1. (a)
2. (d)
3. (c)
4. (c)
5. (b)
6. (c)
7. (b)
8. (d)
9. (a)
10. (a)
11. (d)
12. (b)
13. (b)
14. (d)

LEVEL 2 Objective Questions

15. (b)
16. (d)
17. (c)
18. (c)
19. (d)
20. (a)
21. (c)
22. (c)
23. (a)
24. (a)
25. (d)
26. (c)
27. (d)

LEVEL 3 Conventional Questions

Solution : 1

Attenuation = 250 – 214.54 = 35.46 m^3/s

Lag time, t_L = 60 – 36 = 24 hours

Solution : 2

Time, t = 42.25 years

Solution : 5

Thus discharge corresponding to return period of 500 years

= 565.54 m^3/s = 566 m^3/s (say)

Solution : 6

(i) Annual flow with 50% dependability = 1462.16 Mm^3

(ii) Daily discharge with 75% dependability = 41.837 m^3/sec

Solution : 7

(i) 25 year peak runoff from watershed = 64.46 m^3/s

(ii) Peak discharge, Q_p = 99.72 m^3/s

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