

UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEORAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

MAIN EXAMINATIONS: DECEMBER, 2017

BSc AND B.Ed IV

TITLE OF PAPER : WATER RESOURCES PLANNING

COURSE NUMBER : GEP421

TIME ALLOWED : THREE (3) HOURS

**INSTRUCTIONS : QUESTION 1 IS COMPULSORY
ANSWER ANY 2 QUESTIONS FROM SECTION B
ILLUSTRATE YOUR ANSWERS WITH
APPROPRIATE DIAGRAMS**

**MARKS ALLOCATED : QUESTION ONE CARRIES 40 MARKS
OTHER QUESTIONS CARRY 30 MARKS EACH**

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED
BY THE INVIGILATOR**

SECTION A: COMPULSORY QUESTION**QUESTION1**

- (a) 'One of the basic concepts of engineering economy analysis is that money has a time value'. Explain the validity of this statement. (5 marks)
- (b) 'Planning in the sector of water resources is endless'. Discuss (10 marks)
- (c) A rural community would like to purchase either a diesel engine or a gasoline engine to drive a water pump. Using the information in Table 1 below and a minimum attractive rate of return of 10%, determine which engine is more attractive using the Uniform Annual Cash Flow method of analysis. (25 Marks)

(40 Marks)

Table 1 Information for the diesel and gasoline engine

| ITEMS | DIESEL | GASOLINE |
|--------------------|---------|----------|
| First cost | E8000 | E5000 |
| Estimated life | 5 years | 3 years |
| Annual fuel costs | E1800 | E2400 |
| Annual maintenance | E400 | E800 |
| Salvage value | E1200 | E400 |

SECTION B: ANSWER ANY TWO QUESTIONS**QUESTION2**

- (a) Describe the data needed in the planning of a water resources scheme. (15 marks)
- (b) Distinguish between multi-sectorial and sectorial planning in the sector of water resources. (15 marks)

(30 Marks)

Table 1

Interest Per Period $i = .10000$

| n | Single Payment | | Uniform Series | | | | Gradient | | n |
|----|-----------------------|---------------------|--------------------|------------------------|-----------------------|---------------------|----------------------|---------------------|----|
| | Compound Amount (F/P) | Present Worth (P/F) | Sinking Fund (A/F) | Capital Recovery (A/P) | Compound Amount (F/A) | Present Worth (P/A) | Uniform Amount (A/G) | Present Worth (P/G) | |
| 1 | 1.100 | .9091 | 1.00000 | 1.10000 | 1.000 | .909 | .000 | .000 | 1 |
| 2 | 1.210 | .8264 | .47619 | .57619 | 2.100 | 1.736 | .476 | .826 | 2 |
| 3 | 1.331 | .7513 | .30211 | .40211 | 3.310 | 2.487 | .937 | 2.329 | 3 |
| 4 | 1.464 | .6837 | .21547 | .31547 | 4.641 | 3.170 | 1.381 | 4.378 | 4 |
| 5 | 1.611 | .6207 | .16380 | .26380 | 6.105 | 3.791 | 1.810 | 6.862 | 5 |
| 6 | 1.772 | .5645 | .12961 | .22961 | 7.716 | 4.855 | 2.224 | 9.684 | 6 |
| 7 | 1.949 | .5132 | .10541 | .20541 | 9.487 | 6.868 | 2.622 | 12.763 | 7 |
| 8 | 2.144 | .4665 | .08744 | .18744 | 11.436 | 9.835 | 3.004 | 16.029 | 8 |
| 9 | 2.358 | .4241 | .07364 | .17364 | 13.579 | 13.759 | 3.372 | 19.421 | 9 |
| 10 | 2.594 | .3855 | .06275 | .16275 | 15.937 | 19.145 | 3.725 | 22.891 | 10 |
| 11 | 2.853 | .3505 | .05396 | .15396 | 18.531 | 26.495 | 4.064 | 26.396 | 11 |
| 12 | 3.138 | .3186 | .04676 | .14676 | 21.384 | 36.814 | 4.388 | 29.901 | 12 |
| 13 | 3.452 | .2897 | .04078 | .14078 | 24.523 | 50.103 | 4.699 | 33.377 | 13 |
| 14 | 3.797 | .2633 | .03575 | .13575 | 27.975 | 67.367 | 4.996 | 36.800 | 14 |
| 15 | 4.177 | .2394 | .03147 | .13147 | 31.772 | 90.606 | 5.279 | 40.152 | 15 |
| 16 | 4.595 | .2176 | .02742 | .12742 | 35.950 | 122.824 | 5.549 | 43.416 | 16 |
| 17 | 5.054 | .1978 | .02466 | .12466 | 40.545 | 168.022 | 5.807 | 46.582 | 17 |
| 18 | 5.560 | .1797 | .02193 | .12193 | 45.599 | 228.201 | 6.053 | 49.640 | 18 |
| 19 | 6.116 | .1635 | .01955 | .11955 | 51.159 | 308.365 | 6.286 | 52.583 | 19 |
| 20 | 6.727 | .1486 | .01746 | .11746 | 57.275 | 408.514 | 6.508 | 55.407 | 20 |
| 21 | 7.400 | .1351 | .01562 | .11562 | 64.002 | 548.649 | 6.719 | 58.110 | 21 |
| 22 | 8.140 | .1223 | .01401 | .11401 | 71.403 | 738.772 | 6.919 | 60.689 | 22 |
| 23 | 8.954 | .1117 | .01257 | .11257 | 79.543 | 1008.883 | 7.108 | 63.146 | 23 |
| 24 | 9.850 | .1015 | .01130 | .11130 | 88.497 | 1388.985 | 7.288 | 65.481 | 24 |
| 25 | 10.835 | .0923 | .01017 | .11017 | 98.347 | 1919.077 | 7.458 | 67.696 | 25 |
| 26 | 11.918 | .0839 | .00916 | .10916 | 109.182 | 2649.161 | 7.619 | 69.794 | 26 |
| 27 | 13.110 | .0763 | .00826 | .10826 | 121.100 | 3589.237 | 7.770 | 71.777 | 27 |
| 28 | 14.421 | .0693 | .00745 | .10745 | 134.210 | 4889.307 | 7.914 | 73.650 | 28 |
| 29 | 15.863 | .0630 | .00673 | .10673 | 148.631 | 6589.370 | 8.049 | 75.415 | 29 |
| 30 | 17.449 | .0573 | .00608 | .10608 | 164.494 | 8889.427 | 8.176 | 77.077 | 30 |
| 31 | 19.194 | .0521 | .00550 | .10550 | 181.943 | 12089.479 | 8.296 | 78.640 | 31 |
| 32 | 21.114 | .0474 | .00497 | .10497 | 201.138 | 16389.526 | 8.409 | 80.108 | 32 |
| 33 | 23.225 | .0431 | .00450 | .10450 | 222.252 | 22189.569 | 8.515 | 81.486 | 33 |
| 34 | 25.548 | .0391 | .00407 | .10407 | 245.477 | 29989.609 | 8.615 | 82.777 | 34 |
| 35 | 28.102 | .0356 | .00369 | .10369 | 271.024 | 40589.644 | 8.709 | 83.987 | 35 |
| 40 | 45.259 | .0221 | .00226 | .10226 | 442.593 | 100889.679 | 9.296 | 88.953 | 40 |
| 45 | 72.890 | .0137 | .00139 | .10139 | 718.905 | 163889.663 | 9.374 | 92.454 | 45 |
| 50 | 117.391 | .0085 | .00086 | .10086 | 1163.909 | 241889.615 | 9.570 | 94.889 | 50 |
| 55 | 189.059 | .0053 | .00053 | .10053 | 1880.591 | 353889.597 | 9.708 | 96.562 | 55 |
| 60 | 304.987 | .0033 | .00033 | .10033 | 3034.816 | 515889.567 | 9.802 | 97.701 | 60 |

QUESTION 3

Discuss the usefulness of the International Water Law in water management between riparian countries. **(30 Marks)**

QUESTION 4

'Swaziland has plenty of water and yet it suffers from water scarcity related problems'. Discuss this statement. **(30 Marks)**

QUESTION 5

- a) Using examples discuss suitable drought mitigation measures for Swaziland. **(15 marks)**
 - b) Discuss correlative rights in water law. **(15 marks)**
- (30 Marks)**