UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

FINAL EXAMINATION, DECEMBER 2017

B.A.,B.Ed., BSc.,BASS, (FT/PT)

TITLE OF PAPER: INTRODUCTION TO THE NATURAL ENVIRONMENT

COURSE NUMBER: GEP111

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS: THIS PAPER IS DIVIDED INTO THREE SECTIONS

SECTION A: TECHNIQUES AND SKILLS

PLEASE ANSWER IN A SEPARATE ANSWER BOOK.

    1. ANSWER ALL QUESTIONS (COMPULSORY)

    2. THIS SECTION CARRIES 40 MARKS

SECTION B: SHORT ANSWERS / ESSAYS

    1. ANSWER ANY ONE QUESTION

    2. EACH QUESTION CARRIES 35 MARKS

SECTION C: SHORT ANSWERS / ESSAYS

    1. ANSWER ANY ONE QUESTION

    2. EACH QUESTION CARRIES 25 MARKS

SPECIAL REQUIREMENTS: Graph paper, Tracing paper, Map of Swaziland 1:50 000
Hlathikhulu Sheet No. 23

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION IS GRANTED BY
THE INVIGILATOR. THE PAPER CONSISTS OF 6 PAGES.

GEP111: INTRODUCTION TO THE NATURAL ENVIRONMENT –DECEMBER 2017

SECTION A: TECHNIQUES AND SKILLS (40 MARKS)
COMPULSORY

QUESTION 1
(For all questions requiring a map, refer to 1:50 000 Map of Swaziland: Hlathikhulu Sheet No. 23)

a)   Using the map provided give the 6-figure grid reference of the following locations.
i)   Jerusalem School   (2 marks)
ii) Lakolwane Trigonometric Station   (2 marks)
iii) Maliyaduma School   (2 marks)

b)   If the time at Greenwich is 1100 hours, what will the time be at the following locations?
i)   130°W   (2 marks)
ii)   157°E   (2 marks)
iii)   33°E   (2 marks)

d)   Calculate the straight line distance between Salem Primary School and Christ the King School in both metres and kilometres.   (3 marks)

e)   Calculate the distance along the road between Salem Primary School and Christ the King School in both metres and kilometres.   (4 marks)

e)   Using the map provided calculate the total surface area for Farm no. 685 in hectares and square kilometres.   (6 marks)

f)   Copy and complete Table 1 below   (6 marks)
Table 1: The relationship between area of maps, scale and true area on earth

Area on Map	Scale of Map	True area on Earth
63.5cm²	1:120 000	.............km²
.........cm²	1:10 000	172.3 ha

h)   Using the information in Tables 2.1, 2.2, 2.3 and 2.4 copy and complete the Table 2 below (calculate the incoming, out-going and net radiation in the following table for the month of March)   (9 marks)
Table 2: Copy and complete missing values

Location	es	T (°C)	n (hours)	Ri	Ro	H
40 °N	12	11.5	10.7			
0°	14.35	24	11.0			
20 °S	9.2	18	9.2			

(40 Marks)

Table 2.1:Solar Radiation (R$_a$) expressed in equivalent evaporation (mm/day)

Latitude	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
60°N	1.4	3.6	7	11.1	14.6	16.4	15.6	12.6	8.5	4.7	2	0.9
50°N	3.7	6	9.2	12.7	15.5	16.6	16.1	13.7	10.4	7.1	4.4	3.1
40°N	6.2	8	11.1	13.8	15.9	16.7	16.3	14.7	12.1	9.3	6.8	5.6
30°N	8.1	10.5	12.8	14.7	16.1	16.5	16.2	15.2	13.5	11.2	9.1	7.9
20°N	10.8	12.4	14	15.2	15.7	15.8	15.8	15.4	14.4	12.9	11.3	10.4
10°N	12.8	13.9	14.8	15.2	15	14.8	14.9	15	14.8	14.2	13.1	12.5
Equator	14.6	15	15.2	14.7	13.9	13.4	13.6	14.3	14.9	15	14.6	14.3
10°S	14.6	15	15.2	14.7	13.9	13.4	13.6	14.3	14.9	15	14.6	14.3
20°S	16.8	15.7	15.1	13.9	12.5	11.7	12	13.1	14.4	15.4	15.7	15.8
30°S	17.2	15.8	13.5	10.9	8.6	7.5	7.9	9.7	12.3	14.8	16.7	17.5
40°S	17.3	15.1	12.2	8.9	6.4	5.2	5.6	7.6	10.7	13.8	16.5	17.8
50°S	16.9	14.1	10.4	6.7	4.1	2.9	3.4	5.4	8.7	12.5	16	17.6
60°S	16.5	12.6	8.3	4.3	1.8	0.9	1.3	3.1	6.5	10.8	15.1	17.5

Source: Shaw, 1983. *Hydrology in Practice*

Table 2.2:Values of σT⁴									
°F	0	1	2	3	4	5	6	7	8	9
30	11	11.1	11.2	11.3	11.4	11.5	11.6	11.6	11.7	11.9
40	11.9	12	12.1	12.2	12.3	12.4	12.5	12.6	12.7	1 2.8
50	12.9	130	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.9
60	14	14.1	14.2	14.3	14.4	1.5	14.6	14.5	14.8	14.9
°C									
-0	11.2	11							
0	11.2	11.4	11.5	11.7	11.9	12	12.2	12.3	12.5	12.7
10	12.9	13.1	13.3	13.5	13.7	13.9	14	14.2	14.4	14.6
20	14.8	15	15.2	15.4	15.6	15.8	16	16.2	16.4	16.6

Source: Shaw, 1983. *Hydrology in Practice*

Table 2.3: Relationship between noon solar angle and intensity of solar radiation

Solar angle	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
0°	0	1.75	3.49	5.23	6.98	8.72	10.5	12.2	13.9	15.6
10°	17.4	19.1	20.8	22.5	24.2	25.9	27.6	29.2	30.9	32.6
20°	34.2	35.8	37.5	39.1	40.7	42.3	43.8	45.4	47	48.5
30°	50	51.5	53	54.5	55.9	57.4	58.8	60.2	61.6	62.9
40°	64.3	65.6	66.9	68.2	69.5	70.7	71.9	73.1	74.3	75.5
50°	76.6	77.7	78.8	79.9	80.9	81.9	82.9	83.9	84.8	85.7
60°	86.6	87.5	88.3	89.1	89.9	89.9	90.6	92.1	92.7	93.4
70°	94	94.6	95.1	95.6	96.1	96.6	97	97.4	97.8	98.2
80°	98.5	98.8	99	99.3	99.5	99.6	99.8	99.9	99.9	100

Table 2.4:mean daily duration of maximum possible sunshine hours (N)

North Lat.	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
South Lat.	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
60°N/S	6.7	9	11.7	14.5	17.1	18.6	17.9	15.5	12.9	10.1	7.5	5.9
58°N/S	7.2	9.3	11.7	14.3	16.6	17.9	17.3	15.3	12.8	10.3	7.9	6.5
56°N/S	7.6	9.5	11.7	14.1	16.2	17.4	16.9	15	12.7	10.4	8.3	7
54°N/S	7.9	9.75	11.7	13.9	15.9	16.9	16.5	14.8	12.7	10.5	8.5	7.4
52°N/S	8.38	9.94	11.8	13.8	15.6	16.5	16.1	14.6	12.7	10.6	8.8	7.8
50°N/S	8.58	10	11.8	13.7	15.3	16.3	15.9	14.4	12.6	10.7	9	8.1
48°N/S	8.8	10.2	11.8	13.6	15.2	16	15.6	14.3	12.6	10.9	9.36	8.3
46°N/S	9.1	10.4	11.9	13.5	14.9	15.7	15.4	14.2	12.6	10.9	9.5	8.7
44°N/S	9.3	10.5	11.9	13.4	14.7	15.4	15.2	14	12.6	11	9.7	8.9
42°N/S	9.4	10.6	11.9	13.4	14.6	15.2	14.9	13.9	12.6	11.1	9.8	9.1
40°N/S	9.63	10.7	11.9	13.3	14.4	15	14.7	13.7	12.5	11.2	10	9.3
35°N/S	10.1	11	11.9	13.1	14	14.5	14.3	13.5	12.4	11.3	10.3	9.86
30°N/S	10.4	11.1	12	12.9	13.6	14	13.9	13.2	12.4	11.5	10.6	10.2
25°N/S	10.7	11.3	12	12.7	13.3	13.7	13.5	13	12.3	11.6	10.9	10.6
20°N/S	11	11.5	12	12.6	13.1	13.3	13.2	12.8	12.3	11.7	11.2	10.9
15°N/S	11.3	11.6	12	12.5	12.8	13	12.9	12.6	12.2	11.8	11.4	11.2
10°N/S	11.6	11.8	12	12.3	12.6	12.7	12.6	12.4	12.1	11.8	11.6	11.5
5°N/S	11.8	11.9	12	12.2	12.3	12.4	12.3	12.3	12.1	12	11.9	11.8
Equator	12	12	12	12	12	12	12	12	12	12	12	12

Source: Shaw, 1983. *Hydrology in Practice*

ANSWER SECTIONS B AND C IN A SEPARATE ANSWER BOOK FROM SECTION A

SECTION B: ANSWER ONE OF THE FOLLOWING QUESTIONS:

QUESTION 2:

a) Describe the theory of plate tectonics and describe how this accounts for earthquakes, and why it has replaced the earlier concept of 'Continental Drift'. (15 marks)

b) Discuss WHY the inclination of the earth's axis is an important factor in regulating the heat balance of the earth. (10 marks)

c) Explain the following terms or concepts BRIEFLY: (10 marks)

   i) Aquifer

   ii) Groundwater table

   iii) Troposphere

   iv) Shield volcano

   v) Constructive plate margin (35 Marks)

QUESTION 3:

a) Describe the theory of plate tectonics and explain why it is considered the 'unifying theory' describing the macro-morphology of the earth's surface. (15 marks)

b) Using a suitable diagram, describe the vertical structure of the atmosphere in relation to temperature. (6 marks)

c) Discuss the role and significance of the ozone layer . (4 marks)

d) Explain the following terms or concepts BRIEFLY: (10 marks)

   i) The Big Bang theory

   ii) Metamorphic aureole

   iii) Xenolith

   iv) Artesian well

   v) Composite volcano (35 Marks)

SECTION C: ANSWER EITHER QUESTION 4 OR QUESTION 5

QUESTION 4:

a) Describe the vertical structure of the earth's atmosphere in relation to temperature AND pressure. Indicate the approximate position of the ozone layer. (8 marks)

b) Describe HOW the atmospheric circulation contributes to the heat balance of the earth. (5 marks)

c) Draw a simple diagram to illustrate how a stream may transport it's load. (5 marks)

d) Briefly explain:
   i) the formation of metamorphic rock.
   ii) the basis for the classification of metamorphic rocks, and
   iii) name two examples of **sedimentary** rocks. (7 marks)

(25 Marks)

QUESTION 5:

a) Describe the term 'Global Climate Change', and explain how human behaviour has contributed to this. (4 marks)

b) Using a suitable diagram:
   i) Describe the hydrological cycle, and
   ii) Explain how humans have modified components of the hydrological cycle. (8 marks)

c) Describe why scientists have concluded that there is a heat exchange between the earth's poles and the equator. (4 marks)

d) Sedimentary rocks are classified according to how they form.
   i) Give a detailed description of this classification system, and
   ii) name two **igneous** rocks. (9 marks)

(25 Marks)

* * * * *