UNIVERSITY OF ESWATINI

SEMESTER 1: RE-SIT EXAMINATION PAPER, JULY 2021

B. Sc., B. Ed, BASS, BA. HUMS

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

COURSE CODE:	GEP111
PAPER TITLE:	Introduction to the Physical Environment
TIME ALLOWED:	Three (3) Hours

INSTRUCTIONS:

1. This paper consists of Section (A) and (B)
2. Section(A): techniques and skills is compulsory, Answer all questions (in this section) allocated 40 Marks
3. Section(B): short answers / essays is compulsory Answer all questions (in this section) allocated 35 Marks
4. Section(C): short answers / essays, Answer any questions from this section allocated 25 Marks
5. Illustrate your answers with examples and clearly drawn diagrams where appropriate

SPECIAL REQUIREMENTS: Graph paper, Tracing paper, Map of Swaziland 1:50 000 Big Bend Sheet No. 25)

ALLOCATION OF MARKS: Total marks for the paper is 100

Candidates may complete the front cover of their answer book when instructed by the Chief Invigilator and sign their examination attendance card but must NOT write anything else until the start of the examination period is announced.

No electronic devices capable of storing and retrieving text, including dictionaries and any form of foreign material may be used while in the examination room

DO NOT Turn examination paper over until instructed to do so

GEP111: INTRODUCTION TO THE PHYSICAL ENVIRONMENT- JULY 2021

SECTION A: TECHNIQUES AND SKILLS (40 MARKS)
COMPULSORY

QUESTION 1
(For all questions requiring a map, refer to 1:50 000 Map of Swaziland: Big Bend Sheet No. 25)

a) If the time at Greenwich is 02:00 hours, what will the time be at the following locations?
i). 67°E (2 marks)
ii). 179°W (2 marks)
iii). 76°W (2 marks)

b) Calculate the straight line distance between Big Bend School and Sinyamantulwa School in both metres and kilometres. (2 marks)

c) Calculate the distance along the road between Big Bend School and Sinyamantulwa School in both metres and kilometres. (2 marks)

d) List three ways scale is expressed on a map. (3 marks)

e) What is the location of farm R/607 using the 6-figure grid reference? (4 marks)

f) Using the map provided, calculate the total surface area for Farm no.1149 in hectares and square kilometres. (4 marks)

g) Copy and complete Table 1 below: (9 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**
……cm²	1:135 000	54.675km²
1.47cm²	1:95 000	……ha
31.5cm²	……	66228750cm²

h) Using the information in Tables 1.1, 1.2, 1.3 and 1.4, copy and complete the table below: (Calculate the incoming, out-going, and net radiation in the following table for the month of September) (10 marks)

Location	es	T (°C)	n (hours)	Ri	Ro	H
0°	15.35	20	10.5			
30°S	14.2	26	11.2			

(40 Marks)

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

SECTION B: (35 Marks)

QUESTION 2:

a) Using a suitable diagram, describe the vertical structure of the atmosphere in relation to temperature. (7 marks)

b) Describe the rock cycle in detail, and show how the different rock types are interdependent upon one another. (12 marks)

c) i). Draw a diagram of the hydrological cycle (7 marks)
ii). Explain how humans have affected the hydrological cycle (5 marks)

d) Distinguish clearly between weathering and erosion (4 marks)

SECTION C: ANSWER EITHER QUESTION 3 OR QUESTION 4 (25 Marks)

QUESTION 3:

a) Describe the classification of igneous rocks (12 marks)

b) Explain the role and significance of the ozone layer. (5 marks)

c) Draw a fully labelled sketch of the hydrological cycle (8 marks)

OR

QUESTION 4:

a) Explain
i). Why most places on the earth's surface experience unequal lengths of day and night, and
ii). What effect this has on planet earth?
(10 marks)

b) Define the concept of an artesian well, and explain how it supplies water. (5 marks)

c) Describe the basis for the classification of sedimentary rocks and give two appropriate examples to illustrate your answer. (10 marks)

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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 σT^4										
°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	Jun e	July	Aug	Sept	Oct	Nov	Dec
South Lat.	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Ma y	Jun e
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*

Equations

Fahrenheit to Celsius: $^{\circ}C = \frac{5}{9}(^{\circ}F - 32)$

Celsius to Fahrenheit: $^{\circ}F = \frac{9}{5}{}^{\circ}C + 32$

Kelvin to Celsius: $K = {}^{\circ}C + 273.15$

Celsius to Kelvin: $^{\circ}C = K - 273.15$

Fahrenheit to Kelvin: $K = {}^{\circ}F + 457.87$

Kelvin to Fahrenheit: $^{\circ}F = K - 457.87$

1 centimeter	= 10 millimeters	1 cm	= 10 mm
1 meter	= 100 centimeters	1 m	= 100 cm
1 kilometer	= 1000 meters	1 km	= 1000 m
1 inch	= 2.54 centimeters	1 in	= 2.54 cm
1 foot	= 30.48 centimeters	1 ft	= 30.48 cm
1 yard	= 91.44 centimeters	1 yd	= 91.44 cm
1 yard	= 0.9144 meters	1 yd	= 0.9144 m
1 mile	= 1609.344 meters	1 mi	= 1609.344 m
1 mile	= 1.609344 kilometers	1 mi	= 1.609344 km

$$R_o = \ldots \sigma T^4 \left\{0.56 - 0.09\sqrt{e_s}\right\}\left\{0.1 + \left(0.9 \times \left(n \div N\right)\right)\right\} \quad mm/day$$

$$e/e_s \times 100$$

$$K = \left(120.6 - T\right)\left(4\sqrt{v+5} - v/4\right)$$

$$R = \frac{\left(1 \div A\right)\left(\sum R_j a_j\right)}{n}$$

$$R = \left(1 \div n\right)\left(\sum R_j\right)$$

$$R = \left(1 \div A\right)\left(\sum r_i a_i\right)$$

$$R_i = 0.95 R_a \times \left(n \div N\right) \quad mm/day$$

$$Q = m^3/s$$

$$q_j = \frac{\left(v_j + v_{j+1}\right)}{2}\frac{\left(y_i + y_{i+1}\right)}{2} b_j$$

$$Q = \sum q_j$$