

**MATHEMATICS**

**……/…../2021**

**8h30 am -11h30am**

**SENIOR FIVE END OF YEAR EXAMINATIONS, 2020/2021**

**SUBJECT: MATHEMATICS**

**COMBINATIONS:**

**PHYSICS-CHEMISTRY-MATHEMATICS (PCM)**

**MATHEMATICS-CHEMISTRY-BIOLOGY (MCB)**

**MATHEMATICS- PHYSICS- COMPUTER SCIENCE (MPC)**

**MATHEMATICS-COMPUTER SCIENCE –ECONOMICS (MCE)**

**MATHEMATICS –PHYSICS- GEOGRAPHY (MPG)**

**MATHEMATICS-ECONOMICS-GEOGRAPHY (MEG)**

|  |
| --- |
|  **/100** **Marks:** |

**DURATION: 3 HOURS**

**INSTRUCTIONS:**

1. Do not open this question paper until you are told to do so.
2. Answer all questions: **100 marks**
3. Use only a **blue** or **black** pen.

**SENIOR FIVE CORE MATHEMATICS COMPREHENSIVE ASSESSMENT,2020/2021**

 1) Light travels from air into an optical fiber with an index of refraction of 1.44

 a) In which direction does the light bend? (4marks)

 b) If the angle of incidence on the end of the fiber is  (6marks)

 what is the angle of refraction inside the fiber?

2) Determine whether the sequence  converges or diverges. (5marks)

3) In a certain school 65% of students are full-time students 55% of students are female 35% of students are male full-time students

Find the probability that

a) A student chosen at random from all the students in the school is a part-time students. (5marks)

b) A student chosen at random from all the students in the school is female and a part-time students(5marks)

4) Transform in product the sum sin 3*x* + sin 4*x* (5marks)

5) In arithmetic progression , the thirteenth terms is 27 and the seventh is three times the second

a) the common ratio (5marks)

b) Find the first term (5marks)

c)the sum of the first ten terms. (5marks)

 6)Solve the equation in $R:$  (10marks)

 7) Find the position of point *A*(4,5,6)and the sphere

 (5marks)

 8) Calculate the following limit  (10marks)

 9) For the matrix 

Find

a)  (4marks)

b)Determinant of  (6marks)

10) The table below shows the results of senior 2 students in Mathematics and Physics Tests

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mathematics marks () | 3 | 5 | 6 | 8 | 9 | 11 |
| Physics marks() | 2 | 3 | 4 | 6 | 5 | 8 |

Answer to the following questions from the table above:

1. Complete the table below (15marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | () |
|  |  |  |  |  |
| 5 | 3 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 11 | 8 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. Find the covariance of  and (5marks)

 **S5 CORE MATHEMATICS COMPREHENSIVE ASSESSMENT 2020 MARKING SCHEME**

Answer 1 **a) 4marks**

a) Since the light is traveling from a rarer region (lower

n) to a denser region (higher n), it will bend toward the

normal.

**Answer b 6marks**

 We will identify air as medium 1 and the fiber as

medium 2. Thus, n1=1.00 (index of air), n2 =1.44 and













Answer 2 5marks





So  diverges

answer 3

**.**F:student is female P(F)=0,55

M:student is male P(M)=1-0,55=0,45**/**

Full: student is fulltime P( Full)=0,65

a)P(Student is part-time)=1-0,65=0,35**/ 5marks**

b) Given that 35%are male,Full-time students P(M$\bigcap\_{}^{}Full$)= 0,35**/ 5marks**

Also P(Full)= P(M$\bigcap\_{}^{}Full)+P(F\bigcap\_{}^{}Full)$

 =0,35+P(F$\bigcap\_{}^{}Full)$

P(F$\bigcap\_{}^{}Full)=0,30$

P(F)=P(F$\bigcap\_{}^{}Full)+P(F\bigcap\_{}^{}Part)$

0,55=0,30+P(F$\bigcap\_{}^{}Part)$

P(Female and Part-time)=0,25

Answer 4 5marks





**answer 5**

Nth term of A, P is given by

$an=a+\left(n-1\right)r$

13th term $a+12r $/

7th term a+6r =3(a+5)

$\left\{\begin{array}{c}a+12r=27\\-2a+3r=0 \end{array}\right.$

27r=54

$r=\frac{54}{27}=2$

 r=2 is common difference 5marks

$a+12.2=27 $

a= 27-24 = 3 a=3 is the 1st term 5marks

S10=$\frac{n(2a+\left(n-1\right)r)}{2}$ Sum of the first ten term, S10= $\frac{10(2.3+\left(10-1\right).2)}{2}=\frac{60+180}{2}=\frac{240}{2}$

S10 =120 / 5marks

Answer 6)$ 2^{x-1}-2^{x-3}=2^{3-x}-2^{1-x}$ 10marks

$2^{x}.2^{-1}-2^{x}.2^{-3}=2^{3}.2^{-x}-2^{1}.2^{-x}$

$\frac{2^{x}}{2}-\frac{2x}{2^{3}}=\frac{2^{3}}{2^{x}}-\frac{2}{2^{x}}$ /

$2^{x}\left(\frac{1}{2}-\frac{1}{8}\right)=(8-2)\frac{1}{2^{x}}$

$2^{x}.\frac{3}{8}=\frac{6}{2x}$

$3.2^{x}.2^{x}=48$

3$2^{2x}=48$

$2^{2x}=\frac{48}{3}$

$2^{2x}=16$

$2^{2x}=2^{4}$

$2x=4$

 x= 2

**Answer 7 5marks**

Centre of sphere is (2,1,−1) and its radius is *r* = 37 .

The distance between the centre of the sphere and the

given point is 



Here *d* . Thus, the point lies outside the sphere.

**Answer 8 10marks**

**( 10marks)**



 =1x1



**answer 9**

1. **4marks**





**b)6marks**





**answer 10)**

 a) Complete the table below **(15marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | () |
| 3 | 2 | -4 | -2.6 | 10.4 |
| 5 | 3 | -2 | -1.6 | 3.2 |
| 6 | 4 | -1 | -o.6 | 0.6 |
| 8 | 6 | 1 | 1.4 | 1.4 |
| 9 | 5 | 2 | 0.4 | 0.8 |
| 11 | 8 | 4 | 3.4 | 13.6 |
|  |  |  |  |  |
|  |  |  |  |  |

b)The Covariance of  and  or **(5marks)**

