KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR
FOURTH YEAR SECOND SEMESTER
SPECIAL/SUPPLEMENATRY EXAMINATION

FOR THE DEGREE OF BACHELOR OF COMMERCE

COURSE CODE: BCO 433

COURSE TITLE: ACTUARIAL SCIENCE

DATE: 17/02/2021 **TIME: 2.00PM-4.00PM**

INSTRUCTION TO CANDIDATES

1) The paper contains **FIVE** questions
2) Attempt **THREE** questions
3) Question **ONE** is Compulsory

TIME: 2 Hours

KIBU observes **ZERO** tolerance to examination cheating

Q1.

(a)

An auto insurance company insures an automobile worth 15,000 for one year under a policy with a 1,000 deductible. During the policy year there is a 0.04 chance of partial damage to the car and a 0.02 chance of a total loss of the car. If there is partial damage to the car, the amount X of damage (in thousands) follows a distribution with density function.

$$f(x) = \begin{cases} 0.5003\, e^{-x/2} & \text{for } 0 < x < 15 \\ 0 & \text{otherwise.} \end{cases}$$

(10 marks)

b)

A policyholder purchases automobile insurance for two years. Define the following events:

F = the policyholder has exactly one accident in year one.
G = the policyholder has one or more accidents in year two.

Define the following events:

i) The policyholder has exactly one accident in year one and has more than one accident in year two.
ii) The policyholder has at least two accidents during the two-year period.
iii) The policyholder has exactly one accident in year one and has at least one accident in year two.
iv) The policyholder has exactly one accident in year one and has a total of two or more accidents in the two-year period.
v) The policyholder has exactly one accident in year one and has more accidents in year two than in year one.

(10 marks)

c)

The number of hurricanes that will hit a certain house in the next ten years is Poisson distributed with mean 4. Each hurricane results in a loss that is exponentially distributed with mean 1000. Losses are mutually independent and independent of the number of hurricanes
Calculate the variance of the total loss due to hurricanes hitting this house in the next ten years. (10 marks)

Q2.

age x	l_x	age x	l_x	age x	l_x	age x	l_x
0	100 000	20	99 277	45	97 817	70	85 201
1	99 562	25	99 148	50	96 923	75	77 504
5	99 484	30	98 981	55	95 510	80	65 457
10	99 440	35	98 743	60	93 393	85	48 163
15	99 387	40	98 386	65	90 159		

a)What is infant mortality per thousand in the table above? Express your answer to 2 decimal places, followed by the phrase per thousand,(5mrks)
b) From the table above what would *10p50* be in both words and figures (5marks)
c) What is Under 5 mortality per thousand in the table? Express your answer to 2 decimal places, followed by the phrase per thousand. 5marks)
d)What is the probability of surviving between exact ages 30 and 40 in the table? (5marks)

[Total marks = 20 marks]

Q3.

a)
Discuss the role of an actuary in insurance business (10 marks)

b)
Highlight ande4xplain factors considered in the Calculation of INSURANCE premiums. (10 marks).

Q4.
a)

A certain brand of refrigerator has a useful life that is normally distributed with mean 10 years and standard deviation 3 years. The useful lives of these refrigerators are independent. Calculate the probability that the total useful life of two randomly selected refrigerators will exceed 1.9 times the useful life of a third randomly selected refrigerator. (10 marks)

b)

An auto insurance company is implementing a new bonus system. In each month, if a policyholder does not have an accident, he or she will receive a 5.00 cash-back bonus from the insurer.

Among the 1,000 policyholders of the auto insurance company, 400 are classified as low-risk drivers and 600 are classified as high-risk drivers. In each month, the probability of zero accidents for high-risk drivers is 0.80 and the probability of zero accidents for low-risk drivers is 0.90. Calculate the expected bonus payment from the insurer to the 1000 policyholders in one year. (10 marks)

Q5. Claims filed in a year by a policyholder of an insurance company have a Poisson distribution with λ=.40. The number of claims filed by two different policyholders are independent events.

(a) If two policyholders are selected at random, what is the probability that each of them will file one claim during the year? (b) What is the probability that at least one of them will file no claims? [20 marks].

TABLE 3.3
Hypothetical Cohort of Abridged Life Table

Age Interval	Probability of Death	Per 1,00,000 Live Birth	
		No. of Persons Surviving at the Exact Age	No. of Deaths During the Age Interval
x to $x + n$	ax	fx	dx
(1)	(2)	(3)	(4)
0—1	.0250	1,00,000	2500
1—5	.0051	97,500	500
5—10	.0031	97,000	300
10—15	.0026	96,700	250
15—20	.0062	96,450	600
20—25	.0083	95,850	800
25—30	.0079	95,050	750
30—35	.0087	94,300	825
35—40	.0013	93,475	1200
40—45	.0217	92,275	2000
45—50	.0332	90,275	3000
50—55	.0579	87,275	5050
55—60	.0857	82,225	7050
60—65	.0133	75,175	10000
65—70	.0460	65,175	13000
70—75	.2251	62,175	14000
75—80	.3114	48,175	15000
80 and over	.3919	33,175	13000