Name: __________________________________________ ID#: __________ Serial #: ___

Instructions.

1. Please turn off your cell phones and place them under your chair. Any student caught with mobile phones on during the exam will be considered under the cheating rules of the University.

2. If you need to leave the room, please do so quietly so not to disturb others taking the test. No two person can leave the room at the same time. No extra time will be provided for the time missed outside the classroom.

3. Only materials provided by the instructor can be present on the table during the exam.

4. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.

5. Use the blank portions of each page for your work. Extra blank pages can be provided if necessary. If you use an extra page, indicate clearly what problem you are working on.

6. Only answers supported by work will be considered. Unsupported guesses will not be graded.

7. While every attempt is made to avoid defective questions, sometimes they do occur. In the rare event that you believe a question is defective, the instructor cannot give you any guidance beyond these instructions.

8. Mobile calculators, I-pad, or communicable devices are disallowed. Use regular scientific calculators or financial calculators only. Write important steps to arrive at the solution of the following problems.

The test is 90 minutes, GOOD LUCK, and you may begin now!

<table>
<thead>
<tr>
<th>Question</th>
<th>Total Marks</th>
<th>Marks Obtained</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1+4=5</td>
<td></td>
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<tr>
<td>2</td>
<td>1+4=5</td>
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<tr>
<td>3</td>
<td>4+4=8</td>
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<tr>
<td>4</td>
<td>1+4=5</td>
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<td>5</td>
<td>1+4=5</td>
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<td>6</td>
<td>1+4=5</td>
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<tr>
<td>7</td>
<td>1+6=7</td>
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<tr>
<td>Total</td>
<td>40</td>
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</tbody>
</table>
Extra blank page
1. (1+4=5 points) You are given:
   i) \( l_x = 80 - x \), for \( 0 \leq x \leq 80 \)
   ii) \( \delta = 0.05 \)

Find \( \overline{A}_{30} \).

2. (1+4=5 points) Calculate the actuarial present value for a 5000 benefit, 30 year endowment insurance providing the death benefit at the moment of death of a male age 35 at issue of the policy. Use the illustrative Life Table, the uniform distribution of deaths over each year of age assumption, and \( i = 0.06 \).
3. \((4+4 = 8\) marks) On the basis of the Illustrative Life Table with interest at the effective annual rate of 6\%, calculate the values of

(i) \(\bar{a}_{25:40}\)

(ii) \(\bar{s}_{25:40}\).

Work Shown (3 points each) and final answer (1 points each)
4. (1+4 = 5 points) For a group of individuals all age $x$, you are given:

(i) 45% are Male ($m$); 55% are Female ($f$)

(ii) Male

<table>
<thead>
<tr>
<th>$k$</th>
<th>$q^m_{x+k}$</th>
<th>$q^f_{x+k}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>1</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>2</td>
<td>0.30</td>
<td>0.15</td>
</tr>
</tbody>
</table>

(iii) $i = 0.04$

Calculate $10,000 \cdot A^1_{x, \bar{x}}$ for an individual chosen at random from this group,

a) 1929  

b) 1870  

c) 1750  

d) 1730  

e) 1703

Work Shown (4 points)

Hence answer is (___)

5. (1+4 = 5 points) For a special whole life insurance on $(x)$, you are given:

(i) $Z$ is the present value random variable for this insurance.

(ii) Death benefits are paid at the moment of death.

(iii) $\mu_{x+t} = 0.012$, $t \geq 0$

(iv) $\delta = 0.08$

(v) $b_t = e^{0.03t}$

Calculate $\text{Var} (Z)$.

a) 0.090  

b) 0.085  

c) 0.080  

d) 0.075  

e) 0.070

Work Shown (4 points)

Hence the answer is (___)
6. (1+4=5 points) For a continuous whole life annuity of 1 on \((x)\), you are given:
(i) \(T_x\), the future lifetime of \((x)\), follows a constant force of mortality 0.015
(ii) The force of interest is 0.01
Calculate \(\Pr(\bar{a}_{\overline{T_x}} > \bar{a}_x)\)
   a) 0.40
   b) 0.44
   c) 0.46
   d) 0.48
   e) 0.50
   Work Shown (4 points)

Hence the answer is ( )

7. (1+6=7 points) For a special 3-year temporary life annuity-due on \((x)\), you are given:
   (i) Annuity Payment
       \[
       \begin{array}{ccc}
       t & \text{Annuity Payment} & p_{x+t} \\
       0 & 15 & 0.96 \\
       1 & 20 & 0.90 \\
       2 & 25 & 0.85 \\
       \end{array}
       \]
   (ii) \(i = 0.05\)
Calculate the variance of the present value random variable for this annuity.
   a) 139
   b) 118
   c) 114
   d) 96
   e) 90
   Work Shown (6 points) Let \(Y\) be the present value random variable for the annuity.

Hence the answer is ( )

END OF TEST PAPER