Name* : *Solution ***Student ID* :**

Question 1

For a geometric annuity Immediate that pays 1 annuallyfor n years . After the first payment , payments thereafter grow by rate of r and the annual interest rate is i .

Show that for $i = r$:

- $(Ga)_{\overline{n}|} = n \cdot v$

$$(Ga)_{\overline{n}|} = \frac{1}{1+i} + \left(\frac{1}{1+i}\right)^2 \cdot (1+r) + \left(\frac{1}{1+i}\right)^3 \cdot (1+r)^2 + \left(\frac{1}{1+i}\right)^4 \cdot (1+r)^3 + \cdots$$

$$but\ i = r$$

$$(Ga)_{\overline{n}|} = \frac{1}{1+r} + \left(\frac{1}{1+r}\right)^2 \cdot (1+r) + \left(\frac{1}{1+r}\right)^3 \cdot (1+r)^2 + \left(\frac{1}{1+r}\right)^4 \cdot (1+r)^3 + \cdots$$

$$(Ga)_{\overline{n}|} = \frac{1}{1+r} + \frac{1}{1+r} + \frac{1}{1+r} + \frac{1}{1+r} + \cdots$$

$$let\ v = \frac{1}{1+i} = \frac{1}{1+r}$$

$$(Ga)_{\overline{n}|} = v + v + v + v + \cdots$$

$$(Ga)_{\overline{n}|} = n \cdot v$$

- $(G\ddot{a})_{\overline{n}|} = n$

$$(Ga)_{\overline{n}|} = n \cdot v$$

$$(G\ddot{a})_{\overline{n}|} = (Ga)_{\overline{n}|} \cdot (1+r)$$

$$(G\ddot{a})_{\overline{n}|} = \left[\frac{1}{1+r} + \frac{1}{1+r} + \frac{1}{1+r} + \frac{1}{1+r} + \cdots\right] \cdot (1+r)$$

$$(G\ddot{a})_{\overline{n}|} = 1 + 1 + 1 + \cdots$$

$$(G\ddot{a})_{\overline{n}|} = n$$

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Question 2

An annuity provides for 12 annual payments .The first payment is \$100 ,paid at the end of the first year, and each susequent payment is 5% more than the one preceding it. Calculate the present value of this annuity, if $i = 0.05$

$$since\ i = r = 5\%$$

$$Then\ (Ga)_{\overline{n}|} = n \cdot v$$

$$(Ga)_{\overline{n}|} = 12 \cdot \frac{1}{1 + 5\%}$$

$$100(Ga)_{\overline{n}|} = 100 \cdot 12 \cdot \frac{1}{1 + 5\%} = 1{,}142.8571428571$$