BM Chapter 19 refinancing practice exam questions

A firm's cost of debt capital r_D depends on its debt-to-value ratio D/V as $r_D = 6\% \times (1 + D/V)$.
The corporate tax rate $T_c = 30\%$

At a 23% debt-to-value ratio, the firm's WACC is 11%

A. At a 23% debt-to-value ratio, what is the firm's cost of debt capital r_D?
B. At a 23% debt-to-value ratio, what is the firm's cost of equity capital r_E?
C. What is the firm's opportunity cost of capital r with all equity financing?
D. At a 34% debt-to-value ratio, what is the firm's cost of debt capital r_D?
E. At a 34% debt-to-value ratio, what is the firm's cost of equity capital r_E?
F. At a 34% debt-to-value ratio, what is firm's WACC?

Part A: At a 23% debt-to-value ratio, the firm's cost of debt capital r_D is $6\% \times (1 + 23\%) = 7.38\%$

Part B: At a 23% debt-to-value ratio, $23\% \times 7.38\% \times (1 - 30\%) + (1 - 23\%) \times r_E = 11\% \Rightarrow$

$r_E = (\, 11\% - 23\% \times 7.38\% \times (1 - 30\%)\,) / (1 - 23\%) = 12.74\%$

Part C: By the Miller and Modigliani theorem, if the corporate tax rate is zero, the opportunity cost of capital does not depend on the debt vs equity financing.

The firm's opportunity cost of capital r is $23\% \times 7.38\% + (1 - 23\%) \times 12.74\% = 11.51\%$

Part D: At a 34% debt-to-value ratio, the firm's cost of debt capital r_D is $6\% \times (1 + 34\%) = 8.04\%$

Part E: At a 34% debt-to-value ratio, $34\% \times 8.04\% + (1 - 34\%) \times r_E = 11.51\% \Rightarrow$

$r_E = (\, 11.51\% - 34\% \times 8.04\%\,) / (1 - 34\%) = 13.30\%$

Part F: At a 34% debt-to-value ratio, the firm's WACC is

$34\% \times 8.04\% \times (1 - 30\%) + (1 - 34\%) \times 13.30\% = 10.69\%$