PNG UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

2020 FIRST SEMESTER EXAMINATION

Fourth Year Mining and Mineral Process Engineering

MN 411: MINERAL ECONOMICS

DATE: TUESDAY 23RD JUNE 2020
TIME ALLOWED: THREE (3) HOURS

START: 8:20 PM

INFORMATION FOR CANDIDATES

1. Write your **NAME** and **Student Number** clearly on the **ANSWER BOOK**. Do it **NOW**.
2. You have ten (10) minutes to read this question paper. You **SHOULD NOT** write in the answer book during this period.
3. There are **THREE PARTS**: (1) Multiple Choice Questions; (2) Time Value of Money Applications; and (3) Discounted Cash Flow Modelling
4. Attempt to **ANSWER ALL THE QUESTONS**
5. Marks as indicated
6. **NO** other materials are allowed in the exam room. This includes Mobile Phones, MPs and other devices

PART 1: MULTIPLE CHOICES (40 Marks) [2 Marks each]

1. Which are the major economic risks that affect the value of a mining project?

a) interest rate, plant capacity, operating costs and market price
b) operating costs, market price, tax rate, foreign exchange and interest rates
c) operating and capital costs, price and exchange rate
d) operating and capital costs, price, inflation and interest rate

2. Discount rate is:

a) an interest rate on borrowed money
b) an interest rate charged on the use of money
c) an interest rate on the future cost of money
d) an interest rate on opportunity cost of money used in an investment

3. Which statement is correct

a) a nominal value is one that has interest included
b) a real value is one that has inflation included
c) a nominal value is a value without inflation
d) a nominal value is a value with inflation included

4. Which is the correct real discount rate if nominal discount rate is 10% and inflation rate is 3%?

a) real discount rate is 9.7%
b) real discount rate is 11%
c) real discount rate is 8.25%
d) real discount rate is 6.8%

5. An accelerated depreciation

a) adds value to the project in a DCF model
b) allows a firm to recover its capital cost in a short period of time
c) enhance a government to collect more tax revenues in later stages of a mine life
d) accelerate extraction of the ore and reduce tax revenues
e) all of above
f) *b* and *c* are correct

11. Which statement/s is/are correct?

a) accounting profit & loss statement and DCF model are same
b) accounting profit & loss statement and computational procedures up to deriving the net after tax profit (NATP) are same
c) accounting cash flow statement and add back deprecation, including financing activities (capex, debt), asset disposal (salvage value) are same
d) all of the above
e) *b* and *c*

12. Which statement/s is/are correct in a nominal DCF model?

a) working capital is expensed in year 1 and recovered in final year by compounding it
b) working capital is expensed in year 1 and recovered in the final year
c) salvage value is compounded in the final year
d) salvage value is realised in the final year as a constant value
e) all of the above
f) *a* and *d*
g) *a* and *c*

13. Which is the most correct statement?

a) present value (PV) = net cash flow/inflation
b) present value (PV) = net cash flow/cost of capital
c) present value (PV) = net cash flow* inflation index
d) present value (PV) = net cash flow/(1+ WACC)^period
e) present value (PV) = net cash flow/(1- WACC)^period

14. Which is/are the most correct statement/s?

a) net present value (NPV) = sum of cash flows
b) net present value (NPV) = sum of gross cash flows
c) net present value (NPV) = sum of net after tax cash flows
d) net present value (NPV) = sum of discounted cash flows
e) net present value (NPV) = product of discounted cash flows
f) *d* and *e*

15. Which is the most correct statement about internal rate of return?

a) IRR = sum of cash flows/ (1+ WACC)^period
b) IRR = sum of NATP/(1+ WACC)^period
c) IRR = a rate derived by summing the PV = capital cost
d) IRR = a rate that causes the sum of cash flows equals to zero
e) d and c are same and thus both are correct

16. Which is the most correct statement?

a) discounted payback period is a period which equals to cumulative sum of NATP
b) discounted payback period is a period which equals to cumulative sum of net cash flows
c) discounted payback period is a period which cumulative net cash flows equal to zero
d) discounted payback period is a period which cumulative discounted net cash flows equal to zero

17. Which is the most correct statement?

a) capital efficiency (KE) = NATP/capital cost
b) capital efficiency (KE) = net cash flows/capital cost
c) capital efficiency (KE) = present value/capital cost
d) capital efficiency (KE) = NPV/capital cost

18. **What is the payback period given the net cash flow given below?**

	Year (0)	1	2	3	4	5	6
Net Cash flow ($M)	-40	12.53	16.81	12.50	8.91	10.22	15.67
Discount factor (10%)		0.9091	0.827	0.751	0.683	0.621	0.565
Present value (PV)		11.39	13.90	9.39	6.09	6.35	8.85
Cumulative PV	-40	-28.61	-14.71	-5.32	0.77	7.12	15.97

a) 4.50 years
b) 3.87 years
c) 3.5 years
d) 3.35 years

19. Which is the most correct financial condition for determining the viability of a mining project?

a) if NPV >0, longer DPBP and lower KE
b) if NPV >0, IRR< WACC and higher KE .
c) if NPV <0, IRR> WACC, longer DPBP and higher KE
d) if NPV >0, IRR> WACC, shorter DPBP and higher KE

20. What things can you identify to be wrong with placements of items in the cash flow section of a DCF model below?

Cash flow ($M)	Year (0)	1	2	3	4	5	6
NEBT*		12.53	16.81	12.50	8.91	10.22	15.67
Capex ($M)	-20						
Salvage value							7.25
Working capex			-2.7				2.7
Taxes paid		-2.57	-3.45	-3.56	-3.7	-4.05	-1.57
Dividend paid		-1.11	-2.15	-0.98	-3.17	-2.13	-3.25

*Net earnings before tax

a) NEBT, dividend and taxes should not be in the cash flow statement
b) NEBT, working capital and salvage from sales are wrongly placed
c) NEBT, taxes paid, working capital and dividend are wrongly placed
d) NEBT, taxes paid, working capital and depreciation add back misplaced

PART 2: APPLICATIONS OF TIME VALUE OF MONEY [10 Marks]

1. A small mining project developed at the capital cost of $5 million is projected to generate $1 million profit in years 1 to 15. Calculate the NPV of the above project if the discount rate is 10%. [***note capex is already a PV*** [**10 Marks**]

PART 3: DCF MODELING [40 Marks]

A medium scale gold mine has a 4-year mine life. The capital cost is $20 million per year for the 4 years. It will generate about $18 million/year for 4 years at an operating cost of $10 million/year. The working capital is $2 million and a salvage value of $5 million will be realised from the sale of assets in year 4. WACC is 10%, inflation is 3%, income tax is 25% and royalty rate is 2%. Apply the straight line depreciation method.

1. Construct a nominal DCF model **(20 Marks)**
2. Derive the NPV, DPBP and KE. **(10 Marks)**
3. What is the market value of this project? **(5 Marks)**
4. Write a concise summary of this project **(5 Marks)**