



TAXATION PROGRAMME EXAMINATIONS

CERTIFICATE LEVEL

C2: ECONOMICS & FINANCIAL MATHEMATICS

MONDAY 13 JUNE 2016

TOTAL MARKS – 100; TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS TO CANDIDATES

1. You have fifteen (15) minutes reading time. Use it to study the examination paper carefully so that you understand what to do in each question. You will be told when to start writing.
2. This question paper consists of FIVE (5) questions of twenty (20) marks each. You MUST attempt all the FIVE (5) questions.
3. Enter your Student number and your National Registration Card number on the front of the answer booklet. Your name must **NOT** appear anywhere on your answer booklet
4. Do **NOT** write in pencil (except for graphs and diagrams).
5. **Cell Phones** are **NOT** allowed in the Examination Room.
6. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
7. All workings must be done in the answer booklet.
8. Present legible and tidy work.
9. Formulae are provided in a separate booklet.
10. Graph paper (if required) is provided at the end of the answer booklet.

Answer all Five (5) questions

QUESTION ONE

- (a) Outline any three (3) functions of commercial banks. (6 marks)
- (b) Explain how budget deficits in an economy might help to influence the rate of inflation in that economy. (5 marks)
- (c) Explain the contribution of the following sectors to GDP;
- (i) Agricultural Sector. (3 marks)
 - (ii) Manufacturing Sector. (3 marks)
 - (iii) Energy Sector. (3 marks)

[Total: 20 marks]

QUESTION TWO

- (a) Giving two (2) examples of indirect taxes, explain any two (2) of their disadvantages. (6 marks)
- (b) Explain the fiscal policy measures the government can take in order to grow the economy. (4 marks)
- (c) (i) "The problems of a deficit on the current account are more obvious. When a country is continually in deficit, it is importing more goods than it is exporting." Outline four (4) main reasons why a country might be suffering a current account deficit. (4 marks)
- (ii) State and explain three (3) functions of foreign exchange market? (6 marks)

[Total: 20 Marks]

QUESTION THREE

- (a) A company services home air conditioners. It is known that times for service calls follow a normal distribution with mean 50 minutes and standard deviation of 10 minutes.
- (i) What is the probability that a single service call takes more than 60 minutes? (3 marks)
- (ii) What is the probability that a single service call takes between 40 and 65 minute? (3 marks)

- (iii) Find how many minutes it would take if the probability is 0.025 that a single service call takes. (3 marks)
- (b) Mr. Sinkala wants to invest in a poultry project requiring an initial outlay of K 20, 000 and is guaranteed to produce a return of K25, 000 in 3 years' time at an interest rate of 6%.
- (i) Calculate the NPV. Comment on whether this investment is worthwhile. (4 marks)
- (ii) Calculate the internal rate of return. Comment on whether this investment is worthwhile. (4 marks)
- (iii) Would your decision in (b) (i) be affected if the prevailing interest rate were 12%? (3 marks)

[Total: 20 Marks]

QUESTION FOUR

- (a) A manufacturing company has 10 machines of similar type. It is investigating the relationship between the weekly cost of maintenance of these machines and their age. Figures for November, 2012 were as follows:

Machine	1	2	3	4	5	6	7	8	9	10
Age(months) , X	5	10	15	20	30	30	30	50	50	60
Maintenance(in kwachas) , Y	190	240	250	300	310	335	300	300	350	395

- (i) Find the least squares regression of maintenance cost on age. (9 marks)
- (ii) Explain the practical meaning of this regression equation. (2 marks)
- (b) Mr Sangonga invested K6,000 for three years at 7% per annum compounded semi-annually.
- (i) Calculate the total investmet value. (3 marks)
- (ii) Compare the return on the investment when the interest is compounded annually to that when interest is compunded semi-annually. (3 marks)
- (iii) Calculate the total value of investment when compounded Monthly and daily. (3 marks)

[Total: 20 Marks]

QUESTION FIVE

- (a) A farmer buys a farm for K10, 000. He has K6,000 to pay and secures a federal farm loan for the balance to be amortized for 30-years at 5%.
- (i) Find the annual amount. (3 marks)
 - (ii) Build up an amortization schedule for the first 10-years. (9 marks)
- (b) An insurance agent finds that on following up an enquiry the probability of making a sale is 0.4. If on a particular day the agent has two independent enquiries, what is the probability that he will sell:
- (i) insurance to both enquiries; (2 marks)
 - (ii) exactly one policy ; (3 marks)
 - (iii) At least one policy? (3 marks)

[Total: 20 Marks]

END OF PAPER

JUNE 2016: ECONOMICS AND FINANCIAL MATHEMATICS (C2)

SOLUTIONS

SOLUTION ONE

a) Functions of commercial banks

Safe-keeping of Money

This is the basic function of banking. Many customers still keep jewels and important documents in bank safes. However, modern money is mostly in the form of transferable credit, and this function is chiefly performed through the various types of bank account held by customers. The current account is used for day-to-day transactions. Other accounts are usually in the form of "time deposits", i.e. deposits where an agreed period of notice is required for withdrawals without penalty

Transfer of Money

Much of the daily work of the retail banks is concerned with making payments through cheques, standing orders, direct debits and other written instructions,. Some of the work of money transfer has now been passed to the credit card companies (themselves mostly owned by the large banks), but credit card payments still require final settlement by a bank transfer. The large international banks are deeply involved in foreign payments for the import/export trade. Bills of exchange are still used extensively in handling trade payments, especially as these are very closely linked with the extension of credit.

Lending Money

Banks make most of their profits from lending money. Traditionally they have been chiefly concerned with short-term loans –very "short-call" (overnight or 24-hour) loans to other banking institutions, overdrafts, trade loans made by discounting bills of exchange (usually for up to 60 to 90 days) and commercial loans for up to around two years for business or approved private projects.

Money Management, Advisory and Agency Services

The banks have become increasingly involved in selling their financial skills to help people manage their money. They also recognise that they have a responsibility to provide financial help to business ventures which operate with bank money. Apart from becoming financial consultants, banks are also becoming more actively involved in the fringe financial services such as insurance broking, investment advice and the handling of trusts and estates.

b) Budget deficits

A budget deficit can create a multiplier effect, with government spending greater than tax revenue. As consumer incomes rise so will spending. Firms might also be motivated by the fiscal expansion. This could generate more investment. Both higher consumer spending and investment will create pressure on prices and raise the rate of inflation.

c) Economic sectors

(i) Agriculture

Growth in the agriculture sector will enable Zambia to achieve sustainable economic growth and reduce poverty in Zambia. Zambia's vision for the sector is "an efficient, competitive, sustainable and export-led agriculture sector that assures food security and increased income.

Its goal is "to increase and diversify agriculture production and productivity so as to raise the share of its contribution to 20 percent of GDP".

(ii) Manufacturing

Zambia's manufacturing sector is a pivot of economic development through its backward and forward linkages to economic growth, exports and employment creation. It provides a market for primary products and sets the basis for exports with employment generation capacity. Zambia's vision for the Manufacturing sector is technology-based and export-focused manufacturing sector, which is dynamic and competitive with effective entities that add value to the locally abundant natural resources. Zambia's goal is to develop a diversified and competitive export led value adding manufacturing sector which will contribute 12.5 percent to GDP.

(iii) Energy

Zambia's goal for the energy sector is to provide universal access to clean, reliable and affordable energy at the lowest total economic, financial, social and environmental cost. The main thrust of the energy sector will be to expand electricity generation and transmission capacities and enhance cost-effectiveness in fuel supply.

SOLUTION TWO

(a) Two examples of indirect taxes – Customs duties, sales tax, excise taxes, Value Added Tax (VAT)

Disadvantages of indirect taxes

- A very serious objection leveled against indirect taxation is that it is regressive in character. It is inequitable. Burden tax falls more on poor people than on rich people.
- Indirect tax is also uneconomical. State has to spend large amount of money on collection of taxes.
- Revenue from indirect tax is uncertain. State cannot correct estimate as to how much money it will receive from this tax.
- A tax is wrapped up in prices; therefore, it does not create civic consciousness.

(b) Fiscal policy measures to grow the economy (Expansionary fiscal policy measures)

- Cut taxes especially corporation taxes can increase the level of production as companies can now spend less in tax and more in productive activities.
- Increase government expenditure especially on capital projects so that production can increase.

(c) (i) Four main reasons for current account deficit

Increased import penetration:

- Lower production costs mean overseas competitors can produce goods more cheaply than domestic producers.

- Over-valuation of domestic currency makes imports relatively cheaper than domestic products.
- High income elasticity of demand for imports increases demand for imports as national income grows.

Poor exports performance:

- Exports are not competitively priced and so overseas demand will fall.
- Over-valuation of domestic currency makes exports relatively more expensive.
- Low income elasticity of demand in foreign markets, so demand for exports only grows slowly despite foreign national income growing.

(ii) Three functions of the foreign exchange market:

- **Transfer of purchasing power:** Transfer of purchasing power is necessary because international trade and capital transactions normally involves parties living in countries with different national currencies. Each part usually wants to deal in its own currency, but the trade or capital transaction can be invoiced in only one single currency.
- **Provision of credit:** Because the movement of goods between counties takes time, inventory in transit must be financed.
- **Minimisation of foreign exchange risk:** Neither the Zambian importer nor the Japanese exporter may wish to carry the risk of exchange rate fluctuation. Each may prefer to earn a normal business profit on the automobile transaction without exposure to an unexpected change in anticipated profit because exchange rates suddenly change. The foreign exchange market provides hedging facilities for transferring foreign exchange risk to someone else.

SOLUTION THREE

a. i. $\mu = 50$ $\sigma = 10$

let x be the time taken for service calls.

$$\begin{aligned} P(X > 60) &= P\left(z > \frac{60 - \mu}{\sigma}\right) \\ &= P\left(z > \frac{60 - 50}{10}\right) \\ &= P(Z > 1) \\ &= 0.1587 \end{aligned}$$

ii.) $P(40 \leq X \leq 65) = P\left(\frac{40-50}{10} \leq Z \leq \frac{65-50}{10}\right)$

$$= P(-1 \leq Z \leq 1.5)$$

$$= 1 - P(Z > 1.5) - P(Z < -1)$$

$$= 1 - 0.0668 - 0.1587$$

$$= 0.7745$$

$$\text{iii. } P\left(Z > \frac{X-50}{10}\right) = 0.025$$

for a probability of 0.025, $Z=1.96$ (from Z-tables)

$$1.96 = \frac{X-50}{10}$$

$$x = (10)(1.96) + 50$$

$$= 69.6$$

b. i. The present value of $S = K25000$ in 3 years time on a discount rate of 6%

$$P = S\left(1 + \frac{r}{100}\right)^{-t}$$

$$= 25000\left(1 + \frac{6}{100}\right)^{-3}$$

$$= 25000(1.06)^{-3}$$

$$= 20990.48$$

$$NPV = 20990.48 - 20000 = \mathbf{990.48}$$

The project is recommended since this value is **positive**.

ii. To find the Internal Rate of Return (IRR)

$$S = P\left(1 + \frac{r}{100}\right)^t \quad \text{where } S = 25000, \quad P = 20000, \quad t = 3$$

$$25000 = 20000\left(1 + \frac{r}{100}\right)^3$$

$$\left(1 + \frac{r}{100}\right)^3 = \frac{25000}{20000}$$

$$1 + \frac{r}{100} = (1.25)^{\frac{1}{3}}$$

$$\frac{r}{100} = 1.077 - 1$$

$$r = 100(0.077) = 7.7$$

IRR = 7.7%. the project is recommended since this value exceed the marginal rate of 6%.

$$\text{iii. } P = 25000 \left(1 + \frac{12}{100}\right)^{-3} = 17794.51$$

$$\text{NPV} = 17794.51 - 20000 = -2205.49$$

This time the NPV is negative, so project leads to an effective loss and is **not** to be recommended.

SOLUTION FOUR

(a) Let $X = \text{Age}$ and $Y = \text{Maintenance}$

X	Y	XY	X^2
5	190	950	25
10	240	2400	100
15	250	3750	225
20	300	6000	400
30	310	9300	900
30	335	10050	900
30	300	9000	900
50	300	15000	2500
50	350	17500	2500
60	395	23700	3600
$\sum X = 300$	$\sum Y = 2,970$	$\sum XY = 97,650$	$\sum X^2 = 12,050$

Therefore,

$$\beta = \frac{n \sum XY - \sum X \sum Y}{n \sum X^2 - (\sum X)^2} = \frac{10 \times 97,650 - 300 \times 2970}{10 \times 12050 - (300)^2} = \frac{85500}{30500} = 2.8$$

and

$$\alpha = \bar{Y} - \beta \bar{X} = \frac{2970}{10} - 2.8 \left(\frac{300}{10} \right) = 297 - 84 = 213$$

Hence, the least-squares regression line is

$$y = \alpha + \beta x = 213 - 2.8x$$

ii) In general, maintenance costs will be related to the age of the machine; obviously the older the machine, the greater the weekly maintenance cost.

(b) i. $P_0 = K6000$ $r = \frac{7}{100} = 0.07$ $t = 3$ *semi annually implies $m = 2$*

$$P_t = P_0 \left(1 + \frac{r}{m}\right)^{mt}$$

$$P_3 = 6000 \left(1 + \frac{0.07}{2}\right)^{(2)(3)}$$

$$= 6000(1.035)^6$$

$$= 7375.53$$

ii. *annually*; $P_t = P_0(1 + r)^t$

$$= 6000(1 + 0.07)^3$$

$$= K7350.26$$

The gain is $7375.53 - 7350.26 = 25.27$ over when compounded annually.

iii. *Monthly* $P_t = 6000 \left(1 + \frac{0.07}{12}\right)^{(12)(3)} = 7397.55$

Daily $P_t = 6000 \left(1 + \frac{0.07}{365}\right)^{(365)(3)} = 7401.92$

SOLUTION FIVE

a. Here $A = 4000$, $n = 30$, $i = 0.05$

i. $R = \frac{Ai}{1 - (1+i)^{-n}} = \frac{4000(0.05)}{1 - (1.05)^{-30}} = 260.21$

ii. The amortization table is as shown below:

Payment Number	Periodic Payment	Payment of Interest @ 5%	Principal Repaid	Outstanding Principal

1	260.21	200	60.21	4000.00
2	260.21	196.99	63.22	3939.79
3	260.21	193.83	66.38	3876.54
4	260.21	190.51	69.70	3810.16
5	260.21	187.02	73.19	3740.46
6	260.21	183.36	76.19	3667.27
7	260.21	179.52	80.69	3590.42
8	260.21	175.49	84.72	3509.73
9	260.21	171.25	88.96	3425.01
10	260.21	166.80	93.41	3336.05

b. Let the two independent enquiries be A and B

i. with two independent enquiries A and B :

$$\begin{aligned}
 P(A \cap B) &= P(A) \times P(B) \\
 &= 0.4 \times 0.4 \\
 &= 0.16
 \end{aligned}$$

ii. We compute

$$\begin{aligned}
 P(\text{exactly one}) &= P(A \cap \bar{B}) + P(\bar{A} \cap B) \\
 &= P(A)P(\bar{B}) + P(\bar{A})P(B) \\
 &= 0.4 \times 0.6 + 0.6 \times 0.4 \\
 &= 0.48
 \end{aligned}$$

iii.

$$\begin{aligned}
 P(\text{at least one enquiry}) &= 1 - P(\text{no enquiry}) \\
 &= 1 - (0.6 \times 0.6) \\
 &= 0.64
 \end{aligned}$$

END OF SOLUTIONS