



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Four Year) Degree in Industrial Mathematics
Fourth Year - Semester II Examination – June/July 2018

MAT 4302 – FINANCIAL MATHEMATICS

Time: Three (03) hours

Answer any FIVE questions

The use of a non-programmable calculator is permitted

1. Explain each of the following via examples:

- (a) Equilibrium level in a micro-market,
- (b) ESI versus OSI in interest computing,
- (c) Periodic compounding with $m \geq 2$ (Time-value of money),
- (d) Marginal functions in Economics.
- (e) Usage of Progressions (AP, GP, AGP).

2. Compare and contrast the two methods, Merchant's Rule (MR) and United States Rule (USR) in Partial-payments of Transactions.

Using the two methods MR and USR, find the balance due on the maturity date (MD) of a '10 month, 6% note for a 7500 \$' if it is reduced by equal payments of 2500 \$ made 4 months and 7 months **prior** to the maturity date .

3. A micro-market model is described by the sets

$$S = \{ (Q,P): Q - P^3 = 5-20P \} \text{ and}$$

$$D = \{ (Q,P): Q+2P = 40 \}.$$

Depict S and D by representing the market forces Q_s and Q_d in their explicit forms, **via graphs**. Determine the *equilibrium set* E of the market and comment on your results via the zeros of the *excess demand function* $E_d(p)$.

4. (a) Explain what is meant an Annuity and discuss the types of Annuities providing examples.

(b) The Jut-Company must accumulate 26,000 pounds during the next twenty years to replace certain of its physical assets. Find the sum it must invest at the end of each year in a Financial-Company paying 3% effective for this purpose .

5.

Scenario	Probability	$S(0)$	$S(1)$	$S(2)$
ω_1	0.25	100	110	120
ω_2	0.25	100	105	100
ω_3	0.50	100	90	100

Given that $K(n, m) = \frac{S(m) - S(n)}{S(n)}$ and $K(n) = K(n, n+1)$, compute

$K(1)$, $K(2)$ and $K(0,2)$. Also, find the expected returns $E(K(1))$, $E(K(2))$ and $E(K(0,2))$.

Calculate the value of $J[K(1), K(2)] = \frac{[1+E(K(0,2))]}{[1+E(K(1))][1+E(K(2))]}$.

Comment on the nature of returns $K(1)$ and $K(2)$ via the value of $J[K(1), K(2)]$.

6. Explain the key-terms in Cost-Revenue Analysis.

The costs of an Agriculture-firm making tractors are 5000 USD per week in overheads and 200 USD for every tractor made. Weekly revenue is given by $R(q) = q^3 + 180q + 4904$, in USD, where q is the number of tractors made per week. Find each of the following:

- (i) Total cost function $TC(q)$,
- (ii) Profit function $\pi(q)$
- (iii) Break-Even Point (BEP)

7. (a) Establish the annuity formulas for the Present-Value

$A = R a_{\overline{n}|i}$ and; for the Total Amount

$V = R s_{\overline{n}|i}$

(b) A city issues 200,000 USD in 20-YEAR BONDS and creates a fund to redeem bonds when due. For this purpose if the annual taxing is T , and if the fund earns 3% interest via investing, find the value of T .

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