Scholarship Examinations 2018
Engineering with Management

PAPER 1 – XSCH3206 ENGINEERING SCIENCE I: GENERAL MATHEMATICS, MANAGEMENT AND COMPUTER SCIENCE

7 QUESTIONS DO 4, at least 2 from mathematics section

**Syllabus – Computing element, 1 Question on:**
- Control Structures
- Data types
- Importing and exporting data
- Machine number representation
- Writing functions in Matlab
- Programming of simple engineering tasks

**Syllabus – ST1004 element, 2 Questions on:**
- Linear programming: problem, graphical solution, possible solution outcomes.
- Basic probability: conditional probability, laws of probability, the partition law, Bay's law, expected value.
- Decision analysis: components of a decision, decision tables and trees, decision criteria, decision making under uncertainty, value of information; perfect and imperfect information, the utility of money (risk averseness and decreasing marginal worth) and required data structure & algorithm to implement.
- Time value of money: interest, net present value, annuities, amortised loans, futures.
- Networks: spanning tree, shortest path, critical path analysis, maximum flow algorithm.
- Inventory control: the classic model, constant receipt, shortages.
- Time series: properties of time series, moving averages, exponential smoothing.
- Transportation problem: definition, balanced problems, algorithm, initial solutions.

**Syllabus – Mathematics element, 4 questions on:**
- Chapters 6, 7, 8, 9 of Anton's Calculus (the text for the course)
- Chapters 1, 3, 4, 5, 6 of Elementary Linear Algebra – Applications Version, Anton and Rorres

PAPER 2 - XSCH3207 ENGINEERING SCIENCE II: GENERAL MECHANICS AND MATERIALS

Exactly As for General Engineering Paper Engineering Science II, namely

7 QUESTIONS DO 4,


These topics roughly follow the courses and labs associated with 1E4; 1E5; 1E7; 1E10; 2E4.
Syllabus – Manufacturing element (2015-16 Syllabus, Prof Lupoi)
Introduction to Turning, Milling and Drilling
Principal features of these machining operations, material removal rate, cutting force, torque, power, specific energy, cutting time (1MEMS1)

1E6 Electrical Engineering (Prof Harte)
Introductory DC and AC Circuit Analysis; Kirchhoff’s Laws; Thévenin’s Theorem; Maximum Power Transfer. Analysis of RC circuit transients. Number representation and binary arithmetic; signed numbers; Boolean algebra and standard forms; Karnaugh map minimisation; combinational design and standard combinational elements

2E6 Electronics (Profs Dowling and Quinn)
AC network analysis; transient analysis; AC power; DC motors and generators; amplifiers and their equivalent circuits; operational amplifiers (op-amps); introduction to analogue-digital conversion.