NATIONAL UNIVERSITY OF SCINCE AND TECHNOLOGY
DEPARTMENT OF CIVIL AND WATER ENGINEERING
FACULTY OF INDUSTRIAL TECHNOLOGY
BACHELOR OF ENGINEERING (HONOURS) DEGREE
PART III SECOND SEMESTER EXAMINATION-MAY 2011
TRANSPORTATIONNENGINEERING & PLANNING II – TCW 3202

INSTRUCTIONS

Answer any four questions.

Time : 3 hours
Total Marks: 100

Candidates to attempt at least one question from **Section B**

SECTION A

QUESTION 1

(a) i) List the two most common types of line side signals **(2 marks)**

ii) Define a Signalling System and differentiate between a "System" and a Line side signal **(4 marks)**

(b) Describe a semaphore Distant Signal and state:

i) Its positioning relative to the Stop Signal
ii) The expected reaction from the driver when the signal is 'on' (**2 marks)**

(c) i) Explain with the aid of sketches how a train is detected in Track Circuit Block Signalling. **(5 marks)**

ii) Explain the effects of the following on a line with Track Circuit Block Signalling:

- leaves
- steel tape measure **(2 marks)**

iii) What signaling measures can be taken to maximize track capacity in a safe manner.

(5 marks)

iv) Explain the acronym SPAD. Give an example of a fail safe method of safety used in signaling and explain how it works **(5 marks)**

QUESTION 2

i) With the aid of a sketch, briefly explain how you would attach a typical rail onto a concrete sleeper at a straight and level section, define any fixtures and fastenings you will make use of. **(5 marks)**

ii) Draw a fully labeled cross-section of the permanent way and explain the functions of each element. **(10 marks)**

iii) Explain the location and function of catch pits in track side drainage **(2 marks)**

iv) Define the 3 common types of sleepers and expand on the advantages and disadvantages each. **(8 marks)**

QUESTION 3

(a) List the advantages and disadvantages of railway transportation relative to road transportation. **(8 marks)**

(b) You are tasked with reviewing the NRZ's operational model with a view to increasing efficiency through refocusing and restricting the parastatal to certain core activities. Explain and justify the new model you would put forward, discussing the following in particular:

- the permanent way
- railway stations
- rolling stock
- how charges are effected
- punitive charges or fines

Back up your proposal by citing successful similar models elsewhere in the world as well as comparing with toll taking on national roads. **(10 marks)**

(c) Define the following:

i) Switch
ii) Guard or Check rail
iii) Turnout
iv) Grade Compensation **(4 marks)**

(d) List the appropriate Personal Protective wear that a typical railway operative needs to use to allow safe working **(3 marks)**

QUESTION 4

i) Write brief notes on platform design expanding on the following:

- platform height
- track alignment at stations
- centre throw and end throw
- measures to increase user safety
- buffer stops including risk zones **(4 marks)**

ii) Differentiate between renewal and maintenance of the track. Explain what activities are involved in each. **(5 marks)**

iii) Define 2 different types of track defects and explain the likely consequences of not addressing them. **(4 marks)**

iv) Calculate the following elements required to set out a 1 in 8.5 turnout taking off from a Broad Gauge tracking from the toe of switch and tangential to the gauge face and passing through the Theoretical Nose of Crossing (TNC).

- CL
- R_0
- R
- SL
- L **(10 marks)**

Data: CL = 2GN

N = cot Ø

Broad Gauge = 1.676m

SECTION B

QUESTION 5

(a) Explain five factors that should be considered when choosing a site for an airport. **(5 marks)**

(b) Explain five data required in the selection of a site for an airport. **(5 marks)**

(c) i) What does the term 'runway configuration' refer to? **(1 mark)**

ii) List the four basic runway configurations **(4 marks)**

(d) With the aid of a neat sketch describe the wind rose diagram and explain its function in the design of runways. **(10 marks)**

QUESTION 6

(a) Describe the following in relation to airfields with the aid of neat sketches where possible.

i) Taxiway
ii) Blast pad
iii) Runway object-free area
iv) Apron
v) Shoulder **(5 marks)**

(b) Describe the crosswind components and the headwind components for a wind speed of 20 knots when the angle between the runway and direction of wind is 60^0. Use neat sketches to illustrate your solution. **(10 marks)**

(c) Describe the lighting and markings used on a runway highlighting how each contributes to the safe use of the facility. **(10 marks)**