University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011

Subject : Railway Engineering **Class: 3 rd**
Branch : Highway & Bridges **Time : 3 Hours**
Examiner : Dr. Ammar, Dr. Karim **Date : 18/ 6/ 2011**

Notes: Answer FOUR questions.
In your answer use three digits for fractions.
Pay your high attention to the units.

Q1/ A) For locomotive **A1A-B-A1A**, weight = **100 ton**, with energy = **3500 hp**, the number of vehicles = **20** each weight **25 ton** and the number of addition = **2** each weight **15 ton**, the speed at ruling grade = **70 km/h**, static resistance = **12 kg/ton**. Use **Strahle** equations to prove can the locomotive tract the vehicles if the train stopped on ruling grade.

	vehicles	locomotive
k	3200	3000
Δv (km/h)	10	20

13 marks

B) From your engineering point of view, which type of sleepers do you think are better to use: 1- steel. 2- concrete. 3- wooden. And why?

12 marks

Q2/ A) For locomotive contains **6** motors type single phase. The ratio of gear = **60/15**, the torque moment at the beginning of the movement = **350 kg.cm**, the diameter of tracting wheel = **0.96 m**. Calculate: a) the tension force at the beginning of movement. b) the tension force at speed **95 km/h**, if the tension force at speed **85 km/h = 3700 kg**, c) the tension force at the beginning of movement if the locomotive contains **3** motors type continuous current.

13 marks

B) Complete each of the following statements:

1- Friction between wheel and track depends on .....
2- ..... is the resistance between end of axle and the seats in axle box (lubrication).
3- In Davis equation the term $(0.6 + \frac{13}{w})$ refers to .....
4- Train side resistance depends on .....
5- Wave action between rail and wheel in moving can be called ....., this can be equal to .....

12 marks

Q3/ A) Show in details the methods used for treatment of track foundation (roadbed stabilization).

12 marks

B) For a railway line of **30 km** length, with upgrade = **3‰** along **3 km** length. Calculate its virtual length. The line also contains **1800 m** length of curve with radius = **750 m**, knowing that the resistance for rolling and air = **3.6 kg/ton**.

13 marks

Q4/ A) Explain and discuss what we mean by resistance due to friction and wave action.

12 marks

B) A diesel locomotive type **C-A1A** of weight **130 ton**, tract a passenger train of speed **100 km/h**. Use **Talbot** equations to find the max pressure under the center line of the sleeper at depth of **30 cm**. knowing that the sleepers are **wooden** with dimension of **(20*30*280) cm** spaced at **50 cm**.

13 marks

Q5/ A) What do we mean by: (answer four, support your answer by drawings and equations).

1- Rail gauge. 2- Loading gauge. 3- Equivalent straight line. 4- Ruling grade.
5- Virtual length. 6- The track. 7- Ballast section..

12 marks

B) Calculate the max slope can be climbed by a train using the momentum energy of the locomotive alone if the initial speed = **85 km/h** and the final speed = **50 km/h**, on a grade of **7 ‰** and length of: a) **3.5 km**, b) **750 m**

13 marks

****** Good Luck to All ******