

**INSTITUTION OF RAILWAY SIGNAL ENGINEERS  
2017 EXAMINATION**

**MODULE 2 - SIGNALLING THE LAYOUT**

**TIME ALLOWED - 1 1/2 HOURS**

THIS PAPER SHOULD BE TREATED ON THE BASIS OF POWER SIGNALLING IN ACCORDANCE WITH THE PRACTICE WITH WHICH YOU ARE MOST FAMILIAR

ANSWER SHEETS WILL BE PHOTOCOPIED – PLEASE USE ONLY BLACK INK

**CANDIDATES SHOULD ANSWER EITHER**

**PART A (Main Line Practice)**

**OR**

**PART B (Rapid Transit Practice)**

Paper continued on next page

**PART A – TO BE ANSWERED IF USING LAYOUT 1 (Main Line Practice)**

ALL **FOUR** QUESTIONS SHOULD BE ATTEMPTED AND CARRY MARKS AS SHOWN

**Question 1**

a) Determine the minimum braking distances for passenger trains and freight trains using the characteristics specified on layout 1. From your calculations, determine the minimum signal spacing. [5 marks]

b) Determine the best theoretical headway for both **3** and **4** aspect signalling between **B** and **E** at uniform minimum signal spacing and a non-stop passenger train at a speed of **180 km/h**. Explain how the results of these headway calculations determine your choice of signalling system. [5 marks]

c) The branch to station H experiences heavy passenger flows in connection with sporting events at H.

State what is the limiting factor in the number of trains that can traverse the branch.

Determine graphically, or by calculation, the maximum theoretical capacity of the branch in trains per hour. All trains traverse the branch at an average speed of 90km/h. State all assumptions. [10 marks]

**Question 2**

Signal layout 1 in accordance with the notes thereon, numbering the signals (or equivalent) and defining all routes.

[60 marks]

**Question 3**

Number all power worked points and indicate their ‘normal’ position. Add any trap points necessary. Identify hand worked or ground operated points as such.

[10 marks]

**Question 4**

Mark the limits of all train detection equipment and identify each in sequence.

[10 marks]

**END OF PART A**

Paper continued on next page

**PART B – TO BE ANSWERED IF USING LAYOUT 2 (Rapid Transit Practice)**

**ALL FOUR QUESTIONS SHOULD BE ATTEMPTED AND CARRY MARKS AS SHOWN**

**Question 1**

Determine theoretically, either by calculation or graphically, appropriate signal spacings for the braking characteristics and the intensity of traffic on offer. All calculations and graphs must be shown. Include a brief definition of the signalling arrangements and associated systems used, which must include a form of train protection.

[35 marks]

**Question 2**

Signal layout 2 in accordance with the notes thereon, numbering the signals (or equivalent) and defining all routes.

[45 marks]

**Question 3**

Number all power worked points and indicate their 'normal' position. Add any trap points necessary. Identify hand worked or ground operated points as such.

[10 marks]

**Question 4**

Mark the limits of all train detection equipment and identify each in sequence.

[10 marks]

**END OF PART B**

End Of Paper.