Answer All Questions, assume any missing data you may need.

1. a) Draw a neat sketch showing a double railway?
   b) What are the types of sleepers which are used in railroad, describe the advantage of each type?
   c) A railway line of Max. speed 140 km/hr, with normal track width, wooden sleeper and distance from centerline to centerline is 60 cm, the Max. axial load is 26 ton, and distance between axis is more than 3.0 m.
   It is required to:
   i) Design cross section of Vignole Rail from first assumption.
   ii) Draw Vignole Rail with scale 1:1.
   iii) Bending and normal stress in sleeper which cross section is 26x16 cm, if the plate width under rail is 150 mm

2. a) Draw a flow chart showing the main stages in transportation planning procedure.
   b) State the main factors affecting highways design.
   c) It is proposed to widen a two-way highway because of traffic congestion, where counts show that the ADT (2007) is 3500 vehicle/day of which 15% trucks. A traffic development due to improvements on land adjacent to the highway by the end of the design period (2027) is expected to be 600 pcu’s/hour.
   Average normal traffic growth 5% /year, 
   (DHV/ADT) =0.15,
   Directional distribution factor (D) = 70%,
   Practical lane capacity = 600 pcu’s/hour.
   It is required to:
   i) Design the cross section of the proposed new highway.
   ii) Draw your designed cross section showing all dimensions, where the original ground level = (11.00) m and the road level = (13.00) m.

Examiners
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