

PART B — (5 × 16 = 80 marks).

11. (a) (i) Derive an expression for super-elevation in railways. (8)
- (ii) A branch line of eight degree curve, diverges in opposite direction from a broad gauge main line with five degree curve. The speed on the branch line is 30 km/hr. Calculate the Super-elevation and permissible speed on the main line. (8)

Or

- (b) (i) Explain with neat sketches any four obligatory points controlling railway alignment. (8)
- (ii) Illustrate with neat sketches a 'Points and Crossings' and state its working principles. (8)
12. (a) Explain with neat sketches any two methods of Plate Laying and state their relative merits and demerits. Which of those two methods are widely adopted by Indian Railways. (16)

Or

- (b) Draw self-explanatory sketches of the following.
- (i) A Crossing Station (4)
- (ii) A Junction Station (6)
- (iii) A Terminal Station (6)
13. (a) (i) Briefly discuss with sketches any four factors you would keep in view, while selecting a suitable site for an airport. (8)
- (ii) Evaluate the suitability of the site of any one existing international airport in India against those four factors referred in the question. (8)
- 13(a) (i). (8)

Or

- (b) Draw a typical layout of an international airport in India and show locations of Runway, Taxi Way, Apron, Airport Building, Parking and Circulation Area. (16)

14. (a) (i) Following is the average wind data for ten years, when wind intensity is above 6km/hr. An airport is to be designed for two runways. Determine the best runway orientation and calculate total wind coverage.

Wind direction	Percentage of time
N	6.5
NNE	10.4
NE	8.0
ENE	4.2
E	1.7
ESE	0.6
SE	0.7
SSE	3.9
S	7.5
SSW	14.5
SW	10.2
WSW	5.9
W	4.2
WNW	0.3
NW	0.2
NNW	4.8

- (ii) Length of a runway at mean sea level, standard temperature and zero gradients is 1600 m. The site has an elevation of 320 m, with a reference temperature 33.6 degree centigrade. The runway has to be constructed with an effective gradient of 0.25%. Determine the actual length of runway at the site. (6)

Or

- (b) Draw neat sketches and explain the 'Approach zone profile' and 'Clearance over Highways and Railways' for an Instrument Landing System Runway. (16)

15. (a) (i) Describe any four factors of site investigation for location of harbours and the significance of each one of them. (8)
- (ii) Explain any six factors, for which a harbour engineer must have consideration, while planning and designing a harbour. (8)

Or

- (b) (i) Bring out the Environmental Concern of port operations focussing on any four impacts. (8)
- (ii) Illustrate with neat sketches any four types of Coastal Protection works. (8)