



KINGS

COLLEGE OF ENGINEERING



DEPARTMENT OF CIVIL ENGINEERING Question Bank

Sub. Code/Name: CE1356 – RAILWAY ENGINEERING

Year/Sem: III / VI

UNIT I – INTRODUCTION

PART- A

1. What is meant by zonal railways?

The entire railway station has been divided into nine zonal railways having different territorial jurisdictions which are responsible for all management and planning of works.

2. Mention some advantages of railways.

The various advantages of railways may be as follows: a) It aids in the mass migration of people. b) Trade development has increased ten folds after the growth of railways. c) Land values have increased due to increased industrial growth. d) Speedy distribution of finished product is achieved through railways.

3. What do you understand by the term “Buckling of rails”?

The railway track gets out of the original position due to the buckling if the expansion of rails is prevented during hot weather. Such an action is known as “buckling of rails”.

4. What do you understand by the term “Ballast”?

Ballast is the granular material packed under and around the sleeper to transfer loads from sleeper to ballast. It helps in providing elasticity to the truck.

5. What are the different types of gauges?

The different types of gauges are as follows: a) Broad Gauge (B.G.) – 1.67 mtrs. b) Meter Gauge (M.G.) – 1.00 mtrs. c) Narrow Gauge (N.G.) – 0.762 mtrs. d) Light Gauge or Freeder Track Gauge – 0.610 mtrs.

6. Enumerate the various factors that govern the selection of various types of gauges.

There are numerous factors that are dependant in the selection of different gauges. However, few of them are mentioned below:

- a) Cost of Construction
- b) Volume and nature of traffic
- c) Development of the areas
- d) Physical features of the country
- e) Speed of movement

7. What are the advantages of “Coning of wheels”?

The various advantages of coning of wheels are: a) To reduce the wear and tear of the wheel flanges and rails due to rubbing action of flanges with the inside faces of the rail head. b) To provide a possibility of lateral movement of axle to the wheels. c) To restrict the wheels from slipping.

8. Define “Track modulus”.

Track modulus is an index for stiffness of track. It is defined as load per unit length of the rail required to produce a unit depression in the track.

9. List down the various causes of “Track stresses”.

Stresses in the railway track are produced due to many causes as listed below: a) Wheel loads b) Dynamic effect of wheel loads c) Hammer blow d) Horizontal thrust

10. What is a “Sleeper”?

A sleeper is a member laid transversely under the rails which are meant to support the rails over them and transfer the load from rails to ballast.

11. What are the functions of a “sleeper”?

Sleepers perform the following functions: a) To distribute the load from the rails to the index area of ballast underlying it or to the girders in case of bridges. b) They add to the lateral and longitudinal stability of the permanent track to support the rails at a proper level in straight tracks and at proper super elevation on curves. c) To hold the rails to correct gauge. d) To act as an elastic medium in between the ballast and rails to absorb the vibrations of moving loads.

12. What are the different types of sleepers?

Sleepers are classified into the following categories:

i. Wooden sleepers

ii. Metal sleepers a) Cast Iron Sleepers b) Steel sleepers

iii. Concrete Sleepers a) Reinforced Concrete sleepers b) Pre-stressed Concrete Sleepers

13. What do you understand by the term “Fish Plates” and what are its uses?

Fish plates are used in rail joints to maintain the continuity of rails and to permit any expansion or contraction of the rail due to thermal variations. They maintain the correct alignment of the line both horizontally and vertically.

14. What are the different types of “Ballast”?

The different materials that are used vary from broken stone to sometimes earth. A few commonly used types of ballast are the following: a) Broken stone b) Gravel or shingles c) Ashes or cinders d) Moorum e) Blast furnace slag f) Kankar

PART - B

- 1 Discuss the advantages of railways.
2. Give a classification of transportation. Discuss in brief.
3. Enumerate the advantages and disadvantages of railway transport over other modes of transport facilities
4. (a) Define the rail and describe the functions of rail.
(b) What are the causes for the wear of rails?
- 5 Describe the main requirements of an ideal rail section.
- 6 Compare the flat-footed rail and bull headed rails.
- 7 (a) Write the advantages and disadvantages of flat-footed rails.
(b) Write the advantages of welding of rails.
- 8 Describe the corrugated rail and the possible factors, which contribute to the commencement and development of the corrugations.
- 9 What are the function of sleepers and requirements of a good sleeper?
- 10 (a) List the types of sleeper.
(b) Describe the advantages and disadvantages of timber sleepers.
- 11 (a) Define the sleeper.
(b) Describe the advantages and disadvantages of concrete sleepers.
12. (a) List the requirements of good ballast.
(b) Describe the functions of ballast.
- 13 What is ballast? Why is ballast used for in the railway track? Write briefly on the different types of ballast used.
- 14 What are the requirements of an ideal permanent way? What are the factors that govern the cross section and length of rails?

UNIT-II TRACK ALIGNMENT

PART- A

1. What are the objectives of “Reconnaissance Survey”?

The objectives of Reconnaissance Survey are as follows: a) To decide maximum grading and curvature for proposed alignment b) To locate various control points for getting an idea from where the alignment should pass and where the alignment should not. c) To have an idea about possible alternative alignments d) To prepare rough estimates for different proposed alignment to know most economical, efficient and safe alignment.

2. What are the uses of instruments used in preliminary survey?

The various instruments used in preliminary survey are: a) Theodolite - for traversing b) Tacheometer – for plotting main features c) Dumpy level – for drawing the longitudinal cross-sections d) Plain Table – for plotting interior details e) Prismatic Compass – for magnetic bearings of routes and main points.

- 3 Write a small note on the need of construction of a new railway line.

- (1) Strategic reasons
- (2) Connecting trade centers
- (3) Developing a backward area
- (4) Shortening the existing route

- 4 List the factors influencing the selection of a good railway track alignment.

For selection of a good alignment , the following factors are generally considered:

- Obligatory points
- Type of traffic
- Gauge of the track
- Geometric standards
- Topography of the country
- Economic considerations

5. Write the requirements of a good rail alignment.

- (1) Purpose of the track
- (2) Feasibility
- (3) Economy
- (4) Safety
- (5) Aesthetic aspects

6. What are the details taken on reconnaissance survey ?

A reconnaissance survey should provide the following information:

- Accurate topography of the country.
- Towns, railways, river crossings, tunnel sites, etc.
- Geological characteristics of the soil of the area affecting foundations for bridges and stability of the project line.
- Width of waterway required for rivers and drainages.
- Maximum flood levels of the intercepting natural drainages.
- Availability of building materials and labor.
- Probable radii of the horizontal curves.
- The total length of the route.
- Amount of expected earth work.
- The approximate cost of construction of each probable line.

7 What are the factors to be kept in view during reconnaissance survey?

The following factors should be kept in view during reconnaissance survey:

Area: The reconnaissance survey should be carried out for the entire area and not along the line.

Existing roads: Alignment of the existing roads should not be mistaken as suitable route for the new rail track. Road alignments are seldom useful for the construction of a railway line.

Starting of route: The engineer should not reject a particular route only because its start is bad, i.e. a sudden rise of fall. He must ascertain whether the route is bad for a long distance thereafter.

8 What are the instruments used in preliminary survey?

- Plane table
- Dumpy level
- Prismatic compass
- Theodolite
- Tacheometer

9 What is EDM?

Electro-magnetic Distance measurement is a general term used collectively in the measurement of distances applying electronic methods.

10 List the uses of Remote sensing data.

- Gives a birds' eye view of a large areas.
- Ground condition can be defined with a combination of satellite images and topographic maps.

PART- B

- 1 Write a small note on the need of construction of a new railway line.
- 2 List the factors influencing the selection of a good railway track alignment.
- 3 Discuss the requirements of a good rail alignment.
- 4 Explain the reconnaissance survey for a new railway lines.
- 5 Explain the preliminary survey for a new railway lines.
- 6 Explain the location survey for a new railway lines.
- 7 Write brief notes on Obligatory points
- 8 Write brief notes on Track in cutting and Track on embankments.

UNIT-III GEOMETRIC DESIGN OF TRACKS

PART- A

- 1 Enumerate the necessities of “Curves”.
 - a) To bypass natural or artificial obstacles
 - b) To provide easier gradients by diversions from the straight route.
2. What do you understand by the term “Grade compensation”?

The reduction in the grading provided at an intersection of curve and gradient is known as grade compensation on curves
- 3 What is meant by Widening of gauge on Curves
Due to impounding action of the wheels on curves, the gauge of the track gets widened and the rails get tilted outward. To prevent the tendency of tilting the rail outward the gauge of the track on curves is suitably widened. The amount of widening of gauge depends on the radius of the curve, gauge and rigid wheel base of the vehicles
- 4 What are the Various Types of the Gradients
 - (1) Ruling gradients
 - (2) Momentum gradients
 - (3) Pusher gradients
 - (4) Gradients in station yards.
- 5 Define Angle of deflection.
The angle through which forward tangent deflected is called angle of deflection of the curve. It may be either to the either to the right
- 6 What do you understand by cant deficiency?
The cant deficiency may be defined as the difference between the cant necessary for the maximum permissible speed on a curve and the actual cant provided. Higher cant deficiency causes more unbalanced centrifugal force and discomfort to the passengers.
- 7 Why super elevation is necessary on a curve alignment
When a vehicle negotiates a curve, it is subjected to a constant radial acceleration which produces centrifugal force acting horizontally at the centre of gravity of the vehicle, radially away from the centre of the curve. In order to counteract this force, the outer rail of the track is raised slightly higher than the inner rail. The difference in elevation between the outer rail and inner rail is called super elevation or cant.
- 8 Write the types of horizontal curves.
Horizontal curves are classified as under:
 - (1) Simple curves
 - (2) Compound curves
 - (3) Reverse curves and (4) Transition curves.

9 Define Simple curves:

The horizontal curve which consists of a single arc of a circle, is called a simple curve of simple circular curve. Simple circular curves are designated either by their degree or radius. They are inserted between two straights or between two transition curves.

10 Define Compound curves:

The horizontal curve which consists of two or more arcs of different circles with different radii, having different centers on the same side of the common tangent and bending in the same direction, is called a compound curve.

11 Define Reverse curves:

The horizontal curve, which consists of two arcs of different circles of same or different radii, bending in opposite directions with a common tangent at the junction, is called a reverse curve.

12 Define Transition curves:

The horizontal curve of varying radii introduced between a straight and a circular curve, is called a transition curve. A transition curve is also known as curve of easement. The radius of a transition curve varies from the infinity at its beginning to a definite minimum value at the junction of the circular curve.

PART- B

- 1 What do you understand by the following terms for the section of the track.?
 - a Grade compensation on curves
 - b Widening of gauge
- 2 List the various types of gradients that are adopted in laying a railway track.
3. Explain why super elevation is necessary on a curve alignment.
- 4 Explain briefly types of classification of horizontal curves.
5. (a) A five degree curve diverges from a main curve of 4° in an opposite direction in the layout of a B.G. yard. If the speed on the main curve is restricted to 54.53 kmph, determine the speed restriction on the branch line. Assume permissible cant deficiency as 7.5 cm.
(b) What do you understand by cant deficiency? If an 8° curve track diverges from main curve of 5° in an opposite direction in the layout of a B.G. yard, calculate the super elevation and the speed on branch line, if the maximum speed permitted on the main line is 45 kmph.

UNIT-IV

RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION

PART- A

1. What is the necessity of points and crossings?

The knowledge of points and crossings are important in the following ways: a) Points and crossings provide flexibility of movement by connecting one line to another. b) They help in imposing restrictions over turn outs which necessarily retard the movements. c) In regard of safety aspects, points and crossings are weak kinks or points in the track which are susceptible to derailments.

2. List down the different types of crossings.

Crossings may be classified as below:

- a) V-Crossing b) Diamond Crossing c) Square Crossing d) Spring Crossing e) Ramped Crossing

3. What are the component parts of crossing?

- a) Chairs at crossing toe and heel
- b) Wing Rails
- c) Check Rails
- d) Pointed Splice Rails
- e) Vee Piece

4. List down the characteristics of Crossing.

- a) The assembly of crossing has to be rigid to stand against severe vibrations
- b) The wear on parts of wing rails opposite the nose and also of nose itself must be protected.

5. What is flange way depth?

Flange way depth is the vertical distance between the top surface of the stock rail to the top surface of the heel-block used between the stock rail and check rail.

6. List down the necessities of points and crossings?

- a) Points and crossings provide flexibility of movement by connecting one line to another.
- b) They also help for imposing restrictions over turnouts which necessarily retard the movements.

7. List down the different types of track junctions.

The important track junctions commonly employed are: a) Symmetrical split b) Tandem
c) Diamond Crossing d) Single Slip and Double Slip e) Scissor Cross over f) Ladder tracks

8. Define Platform.

Raised level surface from where either passengers board and alight from trains or loading and unloading of goods is done is commonly known as platform. They are of two types, namely, passenger platforms and goods platforms.

9. What do you understand by the term Stations yards?

Yard is defined as a system of tracks laid usually on a level within defined limits for receiving, storing, sorting, making up new trains and dispatch of vehicles.

10. Classify the types of yards.

a) Passenger Bogie yards b) Goods yards c) Marshalling yards d) Locomotive yards

11. What are the objectives of signaling?

The various objectives of providing and operating signals are as below: a) To ensure safety between two or more trains which cross or approach each other's path. b) To provide facilities for maximum utility of the tracks. c) To guide the trains movements during maintenance and repair of tracks. d) To safeguard the trains at converging junctions and give directional indications at diverging junctions.

12. What are the types of signals based on the various categories?

- i. Operating characteristics a) Fog or audible signals b) Visual indication signals
- ii. Functional characteristics a) Shunting signals b) Warner signals c) Semaphore type signals
- iii. Locational characteristics a) Quoter signals (reception) b) Advanced Starter (departure)
- iv. Special characteristics a) Point indicators b) Modified lower quadrant semaphore signals

13. What are the various sources of moisture in a railway track?

The various sources of moisture affecting a railway track are: a) Surface water due to rain, dew or snow. b) Hydrosopic water or Held water. c) Seepage water d) Moisture by capillary action in sub grade

PART- B

1. Write short notes in the followings:
 - Left hand and right hand turn outs
 - Theoretical nose of crossing and Actual nose of crossing
 - Splice rails and Wing rails
 - Point rails and Stock rails
 - Tongue rails and Stretcher bar
2. What is turnout? Draw a neat sketch of Left hand and right hand turn out taking off from a straight track
3. Write a notes on the types of signals
4. Explain with neat sketches the points and crossings used in railways.
5. Explain the materials used for the track construction.
6. What are track junctions and briefly mention the various types of track junctions?
7. (a) On a straight B.G. track, a turnout takes off as an angle of $6^{\circ} 42' 35''$
 - Angle of switch = $1^{\circ} 34' 27''$
 - Length of switch rail = 4.37 m
 - Heel divergence = 11.43 cm
 - Length of straight arm = 0.85 m.Determine the radius and the crossing lead.
(b) A 1 in 12 turn out is to be provided on a B>G> straight track, calculate (i) radius of the curve lead rail (ii) lead distance, and (iii) over all length of the turn out.
Data given:
 - Heel divergence = 133 mm
 - Actual length of switch rail = 6001 mm
 - Theoretical length of switch rail = 6743 mm
 - Distance between toe of crossing and theoretical nose of crossing = 2415 mm
 - Distance between toe of crossing and theoretical nose of crossing = 1498 mm
 - Distance between theoretical nose of crossing and heel of crossing = 3810 mm

UNIT V - MAINTENANCE AND OPERATION

PART- A

- 1 What are the requirements of a track drainage system?
 - a) The track alignment should be made to rest on pervious naturally drained soils.
 - b) The highest level of water table should be much below the level of sub grade.
 - c) Sub surface water should be efficiently drained off by the sub surface drainage system.
 - d) The surface water from adjoining land could be prevented from entering the track formation.
- 2 What are the advantages of good maintenance of railway track?

The life of both track and rolling stock increases by proper maintenance. A well maintained track imparts smooth quality riding surface for vehicles which results in comfort to passengers and safety to goods.
- 3 Write any two necessity of Track Maintenance

The track maintenance is carried out for the following purposes:

 - (1) As a newly laid railway track settles slowly under moving train loads, the maintenance gangs are employed to bring the embankment to the proper formation level.
 - (2) Due to constant movement of heavy and fast moving trains, the packing under sleepers gets loose and thus the geometry of the track gets disturbed. The gauge, alignment longitudinal and cross levels also get affected adversely, Hence, the maintenance gangs are required regularly to rectify these defects as and when these occur.
- 4 Write the essentials of Good Track Maintenance

A well maintained track should have the following characteristics:

 - (1) The correct gauge is within specified limits.
 - (2) Longitudinal levels are uniform.
 - (3) The cross levels are same except on curves where difference in cross levels is equal to the desired super-elevation.
 - (4) Along straights, the alignment is perfectly linear.
 - (5) There is a sufficient quantity of ballast bed.
 - (6) The sleepers are well packed.
 - (7) The formation is well maintained with good track drainage for disposal of rain water.

5 Write any two advantages of Proper Track Maintenance

The advantages of a well maintained track are as under:

(1) A well maintained track provides safe and comfortable journey to passengers.

If the track is not maintained properly, there will be discomfort to the passengers and some times, there may be a derailment of vehicles, causing accidents and consequently loss of lives and property.

(2) Proper maintenance of track increases the life of track as well as that of the rolling stock.

6 What is Rolling stock?

Rolling stock comprises all the vehicles that move on a railway. It usually includes both powered and unpowered vehicles, for example locomotives, railroad cars, coaches, and wagons

7 List the methods of sub-surface drainage methods adopted in railways

- Provision of an inverted filter
- Sand piling
- Laying of Geotextile

8 Write short notes on Drainage of Platforms.

- All end platforms shall normally be sloped away from the track.
- All drains from platform shelters, tea stalls toilets, water taps or other sullage generation points shall be in pipes and normally discharge on the non-track side of the end platform. If necessary longitudinal covered drains may be provided on the platform.

9 What is directed track maintenance?

Directed track maintenance is a method of track maintenance. This is based on the directions that are given for maintenance given everyday rather than routine maintenance. It is a need based maintenance.

10 What is calendar system of maintenance?

Calendar system of maintenance is conventional method. Track maintenance work to be performed by gangs on the course of a year.

PART- B

- 1 Briefly explain about
 - (i) Track drainage
 - (ii) Re- laying of railway track
 - (iii) Track circuiting
2.
 - (i) Explain in detail the miscellaneous measures of track modernization.
 - (ii) Define 'plate laying'. Explain the telescopic methods of plate laying.
3. How are stations classified? Explain the features of each station.
- 4 Explain with neat sketches, how surface and sub-surface water can be removed from railway track.
- 5 Write short notes on Tractive power and Track resistance
- 6 Write brief notes on Level crossings.