

VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK



VI SEMESTER

CE 6604 - RAILWAYS AIRPORT AND HARBOUR ENGINEERING

Regulation – 2013

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DEPARTMENT OF CIVIL ENGINEERING QUESTION BANK

SUBJECT : RAILWAYS AIRPORT AND HARBOUR ENGINEERING

SEM / YEAR: VI/III

UNIT I - RAILWAY PLANNING

Significance of Road, Rail, Air and Water transports - Coordination of all modes to achieve sustainability - Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, - Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- - Soil suitability analysis - Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

PART - A

Q.No	Questions	BT Level	Competence
1.	Define Permanent way.	BT 1	Remember
2.	List out the elements of permanent way.	BT 1	Remember
3.	Define creep of rail and mention its causes.	BT 1	Remember
4.	Define fish plate. Why is it named so?	BT 1	Remember
5.	Define transition curve and list its types.	BT 1	Remember
6.	Define obligatory points.	BT 1	Remember
7.	Distinguish between double headed and bull headed rail.	BT 2	Understand
8.	Differentiate cant and negative cant.	BT 2	Understand
9.	Describe in short about pusher gradient.	BT 2	Understand
10.	Differentiate right hand and left hand turnout.	BT 2	Understand
11.	Classify the stresses produced in a railway track.	BT 3	Application
12.	Classify the methods of survey that should be done for track alignment.	BT 3	Application
13.	A B.G. railway track is designed for a ruling gradient of 1 in 200 on a curve of 2°. Calculate its grade compensation.	BT 3	Application
14.	Explain what is a turnout and why it is required.	BT 4	Analyze
15.	Compare Creep and Kink in Rails.	BT 4	Analyze
16.	Explain the basic requirements of an ideal rail joint.	BT 4	Analyze
17.	Draw a neat sketch of a permanent way and mark its parts.	BT 5	Evaluate
18.	What is to be done if the resistance in gradient is exceeding beyond the allowable limit?	BT 5	Evaluate
19.	What are the factors to be considered in selecting the sleeper?	BT 6	Create
20.	Under what situation is points and crossings recommended?	BT 6	Create

PART - B

1.	Describe in detail about the types of rail joints, rail fixtures and fastenings.	BT 1	Remember
2.	When and where the soil suitability analysis is carried out and explain.	BT 1	Remember
3.	Define gradient and super elevation; List out its types and explain clearly.	BT 1	Remember

4.	i. What are the ideal requirements of a permanent way (7) ii. What the functions of rail fixtures and fastenings. (6)	BT 1	Remember
5.	Compare and contrast the different type of sleepers used in Indian railways.	BT 2	Understand
6.	i. A 5° curve diverges from a 3° main curve in reverse direction in the layout of a B.G. yard. If the speed on the branch line is restricted to 35 kmph determine the restricted speed on the mainline. (6) ii. Explain the different surveys involved in fixing the alignment of railway tracks. (7)	BT 2	Understand
7.	Discuss in detail about points and crossings.	BT 2	Understand
8.	i. A BG curved railway track has a 4° curvature and 12cm cant. Maximum Permissible speed on the curve is 85Km/hr. Calculate the length of the transition curve. (7) ii. An 8° curve track diverges from a main curve of 5° in an opposite direction in the layout of a B.G. yard. Calculate the super elevation and the speed on the branch line, if the maximum speed permitted on the main line is 45Km/hr. (6)	BT 3	Application
9.	Explain the geometric design of railways, Super elevation and gradient in detail.	BT 3	Application
10.	i. Explain the expression to establish the relationship among gauge speed, radius of curvature and super elevation (6) ii. Explain in detail the importance of Indian Railways in the National Development in terms of economic, social and political contributions (7)	BT 4	Analyze
11.	Explain in detail about (a) Ballastless Track (3) (b) Negative superelevation. (4) (c) Widening of gauge (3) (d) Grade Compensation (3)	BT 4	Analyze
12.	Explain in detail about (a) Track Stress (5) (b) If a wheel base of a vehicle moving on a B.G track is 6m the diameter of wheel is 1.5 m and the depth of flanges below the top of rail is 3.17cm. Determine the extra width required to be provided on gauge, if the radius of the curve is 160 m.	BT 4	Analyze
13.	Design and draw a neat sketch of permanent way cross section and explain the functions of its components.	BT 5	Evaluate
14.	Compare the conventional and modern methods of surveying for route alignment and justify which one is the best.	BT 6	Create
PART-C			
1.	What is a sleeper? List the functions, types of sleepers and compare one another.	BT 1	Remember
2.	(i) What do you understand by 'cant deficiency' and 'cant excess'? (7) (ii) Explain in detail about various types of spikes and pandrol clip (8)	BT 6	Create
3.	Explain about (i) Defects in rails (5) (ii) Creep in rails (5)	BT 4	Analyze

	(iii) Coning of wheels	(5)	
4.	What is meant by gradient? Explain various types of gradient in detail	BT 4	Analyze

UNIT II - RAILWAY CONSTRUCTION AND MAINTENANCE

Earthwork – Stabilization of track on poor soil – Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying - Construction and maintenance of tracks – Modern methods of construction & maintenance - Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

PART - A

Q.No	Questions	BT Level	Competence
1.	List out the methods used for stabilization of tracks in poor soil.	BT 1	Remember
2.	Define formation.	BT 1	Remember
3.	List out the methods of tunneling construction.	BT 1	Remember
4.	When is a branch line called as siding?	BT 1	Remember
5.	List out the materials required for laying of track.	BT 1	Remember
6.	Where is a marshaling yard provided?	BT 1	Remember
7.	Summarize the stages in construction of a railway track.	BT 2	Understand
8.	Differentiate metro and mono railway system.	BT 2	Understand
9.	Estimate the number of rails required per Km of railway track.	BT 2	Understand
10.	Describe shortly about passenger platform.	BT 2	Understand
11.	Classify the types of railway stations.	BT 3	Application
12.	Relate the importance of construction and maintenance of tracks.	BT 3	Application
13.	Classify the methods of plate laying.	BT 3	Application
14.	Explain why ventilation should be provided in tunneling.	BT 4	Analyze
15.	Compare the pros and cons of daily maintenance and periodic maintenance.	BT 4	Analyze
16.	Classify the types of marshaling yards.	BT 4	Analyze
17.	What are all the factors is to be considered if a railway station is to be constructed?	BT 5	Evaluate
18.	Design and draw a neat sketch of a junction station.	BT 5	Evaluate
19.	Under what circumstances does a wayside station be selected?	BT 6	Create
20.	Summarize the operations to be carried out for drainage in track.	BT 6	Create

PART - B

1.	Describe in detail about plate laying techniques.	BT 1	Remember
2.	When and where should a tunnel be provided and explain the methods of tunnel construction in soft ground?	BT 1	Remember
3.	List out the type of railway stations and explain each one of them in detail.	BT 1	Remember
4.	Write short notes on i. Track drainage ii. Tunneling methods	(6) (7) BT 1	Remember
5.	Discuss in detail about the modern methods of maintenance.	BT 2	Understand
6.	Summarize how poor soil is being stabilized and explain the methods in detail.	BT 2	Understand
7.	Discuss in detail the materials required for track laying and also write factors considered in the construction of railway track.	BT-2	Understand

8.	Classify the stages in construction of railway track and explain in detail.	BT 3	Application
9.	i. Calculate the quantity of all the materials required for track laying. (6) ii. Classify the advantages and disadvantages of conventional maintenance and modern maintenance techniques. (7)	BT 3	Application
10.	i. Explain in detail about the passenger amenities to be provided in railway station (9) ii. Explain the purpose of different types of yards. (4)	BT 4	Analyze
11.	Explain in detail. i. Wayside Station (3) ii. Branch line siding. (4) iii. Junction Station (3) iv. Passenger Platform (3)	BT 4	Analyze
12.	Explain in detail when a branch line called as siding and the circumstances wayside station to be selected.	BT 4	Analyze
13.	Design and draw a neat sketch of marshaling yard and explain detail.	BT 5	Evaluate
14.	i. On what situations will mono rails, metro rails be selected. Explain (4) ii. Explain in detail about how ventilation and drainage should be provided in tunneling. (9)	BT 6	Create
PART-C			
1.	Explain about the modern methods of construction & maintenance	BT 4	Analyze
2.	What is marshalling yard? Sketch the layout of typical yard and explain its operation.	BT 1	Remember
3.	Briefly explain about Infrastructure for Metro, Mono and underground railways.	BT 4	Analyze
4.	Determine all the elements of a turnout, when the following data is given. Heel Divergence = 13.65cm , Angle of Switch = $1^{\circ}34'27''$, Gauge= 1.676m , Number of Crossing = 8.5	BT 2	Understand

UNIT III - AIRPORT PLANNING

Air transport characteristics-airport classification-air port planning: objectives, components, layout characteristics, and socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, Case studies, Parking and circulation area.

PART - A

Q.No	Questions	BT Level	Competence
1.	List the components of an airport.	BT 1	Remember
2.	List the components of an aircraft.	BT 1	Remember
3.	Tell the advantages of air transport.	BT 1	Remember
4.	Write the objectives of airport master plan.	BT 1	Remember
5.	Write the airport parking configuration .	BT 1	Remember

6.	Describe the general classification of airport.	BT 1	Remember
7.	Distinguish terminal apron and cargo apron	BT 2	Understand
8.	Predict why regional planning is to be done.	BT 2	Understand
9.	Discuss the characteristics of airport layout.	BT 2	Understand
10.	Summarize the four groupings of Aircraft parking system.	BT 2	Understand
11.	Illustrate what is a hangar and mention its types.	BT 3	Application
12.	Show the outline of ICAO master planning process.	BT 3	Application
13.	Classify airport codes based on aircraft wheel load.	BT 3	Application
14.	Drawings for layout plan for an airport - explain	BT 4	Analyze
15.	Comment on the sequence of passenger flow in an airport.	BT 4	Analyze
16.	Analyze the importance of preplanning for an airport project.	BT 4	Analyze
17.	Prepare a typical layout of airport for a single runway and two parallel runways	BT 5	Evaluate
18.	Prepare a list of data's to be collected before site selection.	BT 5	Evaluate
19.	Summarize how the size of gate position decided.	BT 6	Create
20.	Recommend the criteria for site selection.	BT 6	Create
PART - B			
1.	(i) List the factors to be considered for the selection of site for a commercial airport (6) (ii) Explain the importance of airport planning. (7)	BT 1	Remember
2.	What is a master plan? Explain the recommendation by ICAO & FAA master plan in detail.	BT 1	Remember
3.	(i) List out the classification of airport. (7) (ii)Examine the socio-economic characteristics of catchment area (6)	BT 1	Remember
4.	Describe the necessity, functions and types of hangers.	BT 1	Remember
5.	(i)Summarize the survey that is to be done for airport location. (6) (ii)Summarize the planning consideration of a terminal building. (7)	BT 2	Understand
6.	Describe in detail the various components parts of aero plane.	BT 2	Understand
7.	Describe i) Motor vehicle parking area & its patterns (6) ii) Aircraft parking system. (7)	BT 2	Understand
8.	Briefly explain how the size of apron decided.	BT 3	Application
9.	(i) Describe briefly the salient features and functions of aprons in an airport. (6) (ii) Classify the different flying activity. (7)	BT 3	Application
10.	(i)What are the passenger facilities, required at an airport terminal? Explain using sketches. (6) (ii)Analyze the relationship between aircrafts and airports. (7)	BT 4	Analyze
11.	Analyze how the aircraft characteristics importance in designing of airport.	BT 4	Analyze
12.	Explain with neat sketch the typical layout of airport based on runway configuration.	BT 4	Analyze
13.	Draw a typical layout of any international airport in India and explain its concept.	BT 5	Evaluate

14.	Discuss the advantage, disadvantage of air transportation and list the aircraft characteristics for airport planning.	BT 6	Create
PART - C			
1.	What is an airport master plan? Briefly describe the steps in its formulation.	BT 1	Remember
2.	Write about a Case study of any one Typical airport layout.	BT 1	Remember
3.	(i) Describe the points to be considered for the site selection of airports. (6) (ii) Summarize briefly the various geometrics of the runway as recommended by the ICAO. (7)	BT 2	Understand
4.	Bring out the purpose of airport imaginary surfaces.	BT 4	Analyze

UNIT IV - AIRPORT DESIGN

Runway Design: Orientation, Wind Rose Diagram - Runway length - Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of Taxiway Design – Airport Zones – Passenger Facilities and Services – Runway and Taxiway Markings and lighting.

PART - A

Q.No	Questions	BT Level	Competence
1.	How orientation of runway is done? On what basis it is decided.	BT 1	Remember
2.	What is a wind rose diagram?	BT 1	Remember
3.	List the elements to be considered in the Geometric design of runways.	BT 1	Remember
4.	Describe bypass taxiway.	BT 1	Remember
5.	Define clear zone.	BT 1	Remember
6.	Define turning zone	BT 1	Remember
7.	Differentiate runway and taxiway.	BT 2	Understand
8.	Differentiate between VFR and IFR.	BT 2	Understand
9.	Discuss airport markings.	BT 2	Understand
10.	Differentiate type I and type II wind rose diagram.	BT 2	Understand
11.	Illustrate the purpose of installing visual aids in a airport	BT 3	Application
12.	Classify the cases that are to be considered in deciding the basic runway length.	BT 3	Application
13.	Show the importance of various imaginary surfaces around the airport.	BT 3	Application
14.	Explain the term cross wind components and wind coverage.	BT 4	Analyze
15.	Classify the elements of airport lightings.	BT 4	Analyze
16.	Air traffic control aids- explain	BT 4	Analyze
17.	Integrate zoning laws	BT 5	Evaluate
18.	Prepare the list of factors affecting runway capacity.	BT 5	Evaluate
19.	Turning radius in a taxiway is decided based on what?	BT 6	Create
20.	Explain the factors to be considered in locating exit taxiways.	BT 6	Create

PART - B

1.	What are the items to be considered in the geometric design of runway and explain it in detail.	BT 1	Remember
2.	Describe about the geometric design standards of taxiway and also explain Exit taxiway.	BT 1	Remember

3.	i. List out the design consideration in taxiway lighting (6) ii. Tabulate the different elements of airport lighting and explain any two. (7)	BT 1	Remember
4.	Explain what are different control surfaces at an airport? Explain the concepts of airport zoning with the help of sketches.	BT 1	Remember
5.	Discuss in detail about i) Various design factors to be considered in determining the thickness of pavement. (6) ii) Special consideration for pavement design. (7)	BT 2	Understand
6.	Summarize and explain the services and facilities to be provided for the passengers in an airport.	BT 2	Understand
7.	Distinguish between Type I and Type II wind rose diagrams. Explain how the optimum runway orientation is determined.	BT 2	Understand
8.	The typical wind data for an airport site is given in the following table. Determine the best orientation of the runway with the help of a wind rose diagram given in table 1	BT 3	Application
9.	(i) The length of a runway at mean sea level, standard temperature and zero gradients is 1600m. The site has an elevation of 320m, with a reference temperature of 33.6°C. The runway has to be constructed with an effective gradient of 0.25%. Calculate the actual length of the runway at site. (6) (ii) The runway length required for landing at sea level in standard atmospheric condition is 3000m. Runway length required for take-off at a level site at sea level in standard atmospheric condition is 2500m. Aerodrome reference temperature is 25°C & that of standard atmosphere at aerodrome elevation of 150m is 14.025°C. If the effective gradient is 0.5%, determine the runway length to be provided. (7)	BT 3	Application
10.	Explain in brief: 1. Clear Zone. (3) 2. Approach zone (3) 3. Turning zone. (3) 4. Buffer zone. (4)	BT 4	Analyze
11.	Analyze the different methods for designing flexible pavements and explain any two in detail.	BT 4	Analyze
12.	i. The length of runway under standard conditions is 1620m. The airport site has an elevation of 270m. Its reference temperature is 32.90°C. If the runway is to be constructed with an effective gradient of 0.20%. Determine the corrected runway length. (6) ii. Analyze the cases usually considered in determining the basic runway length. (7)	BT 2	Understand

13.	Describe the importance of runway lighting. Explain threshold lighting with the help of sketches.	BT 1	Remember
14.	Explain the various runway and taxiway markings.	BT 4	Analyze
PART-C			
1.	(i) What are the facilities to be provided in the terminal building of an international airport. (ii) Describe the importance of runway lighting. Explain about threshold lighting with neat sketch.	BT 1	Remember
2.	Explain briefly about the Geometric design of runways	BT 4	Analyze
3.	Write about the Elements of Taxiway Design.	BT 1	Remember
4.	What are the different types of terminals? Explain its concepts with neat sketch.	BT 2	Understand

Table 1

Wind Direction	Percentage of time		
	6.4 – 25 Kmph	25-50 Kmph	50-80 Kmph
N	4.7	1.50	0.1
NNE	3.5	0.75	0.0
NE	1.8	0.03	0.1
ENE	3.0	0.02	0.03
E	2.2	2.40	0.0
ESE	5.8	4.95	0.0
SE	7.0	1.40	0.0
SSE	8.0	0.02	0.0
S	4.8	1.40	0.10
SSW	2.6	0.75	0.0
SW	1.2	0.03	0.10
WSW	3.8	0.02	0.03
W	1.9	2.40	0.0
WNW	6.4	5.25	0.0
NW	6.3	1.40	0.0
NNW	7.2	5.20	0.30

UNIT V - HARBOUR ENGINEERING

Definition of Basic Terms: Harbor, Port, Satellite Port, Docks, Waves and Tides – Planning and Design of Harbours: Requirements, Classification, Location and Design Principles – Harbour Layout and Terminal Facilities – Coastal Structures: Piers, Break waters, Wharves, Jetties, Quays, Spring Fenders, Dolphins and Floating Landing Stage – Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works – Environmental concern of Port Operations – Coastal Regulation Zone, 2011.

PART - A

Q.No	Questions	BT Level	Competence
1.	How is breakwater classified?	BT 1	Remember
2.	Write in short about the features of port.	BT 1	Remember
3.	List source of the special types of break water.	BT 1	Remember
4.	What do you understand by littoral drift?	BT 1	Remember
5.	What is a graving dry dock?	BT 1	Remember
6.	Why a shore protection work is needed?	BT 1	Remember
7.	Differentiate Quay and Pier.	BT 2	Understand
8.	Distinguish between diurnal and semi-diurnal tides	BT 2	Understand
9.	Describe wharf. Name the types.	BT 2	Understand
10.	Distinguish between Dolphins & Jetties	BT 2	Understand
11.	Classify Harbour based on location.	BT 3	Application
12.	Illustrate coastal shipping with an example	BT 3	Application
13.	Mention any two erosion protection Methods in Coastal Zone.	BT 3	Application
14.	Mention some of the features of a harbour.	BT 4	Analyze
15.	Explain Breakwater.	BT 4	Analyze
16.	How to design the entrance of a harbor?	BT 4	Analyze
17.	Prepare the list of requirements that is to be considered during design of port.	BT 5	Evaluate
18.	How is Inland Water Transport different from sea transport?	BT 5	Evaluate
19.	Summarize about marine survey.	BT 6	Create
20.	Summarize the requirements of good port.	BT 6	Create

PART - B

1.	Draw a neat sketch of a harbour layout & show the Various Components. Mention the objectives of each.	BT 1	Remember
2.	What is a fender. Explain in detail about its types and classification.	BT 1	Remember
3.	Write in detail about Inland water transports and coastal protection works.	BT 1	Remember
4.	i. Define dredging? Explain the reasons for its adoptions. How dredged Materials are disposed off?	BT 1	Remember
5.	i. Discuss the factors to be considered while selecting a suitable site for the construction of a port. (6) ii. Distinguish Between Pier Wharf. Explain their utility with the help of sketches. (7)	BT 2	Understand
6.	Discuss in detail about the environmental concern required for port operation	BT 2	Understand

7.	i. What are the functions of wet Docks? Explain with Sketches, their working & main features. (8) ii. Explain with sketch the features of a composite Breakwater. (8)	BT 2	Understand
8.	Classify harbours on broad basis and on the basis of utility and explain them.	BT 3	Application
9.	i. Classify different types of break water. Explain any one in brief. (8) ii. Define a port and bring out the differences between a port and a harbor. What are the requirements of good port? (8)	BT 3	Application
10.	Explain the facilities to be provided in a port.	BT 4	Analyze
11.	Explain in brief: i. Littoral drift (3) ii. Wharves and Jetties (4) iii. Fenders (3) iv. Mooring accessories (3)	BT 4	Analyze
12.	Explain different types of break waters with neat sketches.	BT 4	Analyze
13.	Discuss the tides and wave effects and its action on coastal structures.	BT 5	Evaluate
14.	Explain clearly about the coastal regulation zone, 2011.	BT 6	Create
PART-C			
1.	Describe briefly the functions of fixed and floating signals with necessary sketches.	BT 1	Remember
2.	Explain the different types of wind rose diagram for determining the harbor entrance.	BT 4	Analyze
3.	Briefly explain the various types of dredging.	BT 2	Understand
4.	Explain about the wave action on Coastal Structures and Coastal Protection Works	BT 4	Analyze

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S.no	Subject		BT1	BT2	BT3	BT4	BT5	BT6	Total Question
1	Unit-1	Part-A	6	4	3	3	2	2	20
		Part-B	4	3	2	3	1	1	14
2	Unit-2	Part-A	6	4	3	3	2	2	20
		Part-B	4	3	2	3	1	1	14
3	Unit-3	Part-A	6	4	3	3	2	2	20
		Part-B	4	3	2	3	1	1	14
4	Unit-4	Part-A	6	4	3	3	2	2	20
		Part-B	4	3	2	3	1	1	14
5	Unit-5	Part-A	6	4	3	3	2	2	20
		Part-B	4	3	2	3	1	1	14

TOTAL NO.OF QUESTIONS IN EACH PART

PART A	100
PART B	70
TOTAL	170