SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF

CIVIL ENGINEERING

(M.E-STRUCTURAL ENGINEERING)

QUESTION BANK

II SEMESTER

191729–WIND AND CYCLONE EFFECTS ON STRUCTURES
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SUBJECT : 191729–WIND AND CYCLONE EFFECTS ON STRUCTURES

SEM / YEAR: II/ FIRST

UNIT-1 INTRODUCTION			
Introduction, Types of wind – Characteristics of wind – Wind velocity, Method of measurement, variation of speed with height, shape factor, aspect ratio, drag effects - Dynamic nature of wind – Pressure and suctions - Spectral studies, Gust factor.			
PART - A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Write about Wind?	BT-3	**understand**
2.	What do you meant by anemometers?	BT-1	**Remember**
3.	What is meant by wind shear?	BT-1	**Remember**
4.	Classify types of wind according to their behavior.	BT-4	**Creating**
5.	Differentiate the interaction between aerodynamic and semi dynamic.	BT-2	**Application**
6.	Distinguish the main difference between a gust and lull	BT-2	**Application**
7.	Contrast between velocity anemometer and pressure anemometer	BT-2	**Remember**
8.	Briefly explain about characteristics of wind?	BT-5	**understand**
9.	State the function of spectral studies?	BT-1	**understand**
10.	When will create a pressure and suction effects in structures?	BT-6	**Application**
11.	How wind data is obtained?	BT-1	**Creating**
12.	Explain the concept of gust factor and shape factors. Explain briefly?	BT-6	**Remember**
13.	How eddies are formed in Air?	BT-1	**Analyze**
14.	What is the purpose needed for the short term record.	BT-3	**Analyze**
15.	How do you calculate the design of wind speed?	BT-3	**Evaluate**
16.	Mention the factors to be considered in calculating the design wind speed.	BT-4	**Remember**
17.	Explain the drag effect of wind on the structures.	BT-2	**Analyze**
18.	Explain the details about dynamic nature of wind on a structures	BT-4	**understand**
19.	Assess the three types of aerodynamic excitations.	BT-5	**Remember**
20.	Enumerate the application of gust factor method.	BT-1	**Evaluate**

PART - B			
1.	Explain in details about the pressure and suction effects of wind on the structures.	BT-6	**Remember**
2.	Calculate the gust response factor for a tall building with height 100m. The plan dimensions of the building are 20m X 25m. the fundamental frequency of the building is 0.5Hz, critical damping is 5% and the mean wind speed is 30 m/s.	BT-3	**Evaluate**
3.	Explain in details about the different methods used for measuring the wind velocity.	BT-6	**Remember**
4.	Explain the variation of wind speed with respect to drag effects and aspect ratio.	BT-4	**understand**
5.	Estimate the gust response factor for a tall building with 150m height and 25m plan dimension in both the directions. Fundamental frequency of the building is 0.22Hz, critical damping is 5% and the mean wind speed is 35m/s.	BT-5	**Application**
6.	Explain in details about the measurement of wind velocity and its dynamic nature with examples.	BT-4	**understand**
7.	Define wind velocity. What are the characteristics of wind? Explain the different methods to measure the wind velocity.	BT-1	**Creating**
8.	i) Explain the dynamic nature of wind on structure. ii) Write a note on spectral studies.	BT-2	**Analyze**
9.	Write detailed note on method of measurement of wind speed with height.	BT-1	**Creating**
10.	Determine the load on the roof truss of industrial building to be designed using the following information: width of building=25m. Length of building=50m. Height of eaves level=7m. The building has 30 openings each of 1.20m X 1.20m. Life of building 100 years roofing AC sheet purlins ISMC 175. Location near Chennai, in an open industrial area, on a hill slope. The height of the hill is 100m. And the sloping distance measured from the foot of the hill is to the peak is 310m. the building is located at a distance of 10m from peak facing the wind with wind blowing from left to right.	BT-2	**Analyze**
11.	List out the types of anemometers with neat sketches.	BT-2	**Analyze**
12.	Describe in details about: i) Non continuous record ii) Continuous record iii) Short term record	BT-6	**Application**
13.	Explain in details about factors affecting wind speed.	BT-1	**Creating**
14.	Differentiate velocity anemometers and pressure anemometers	BT-3	**Evaluate**

PART-C			
1.	Explain the dynamic nature of wind with a neat sketch.	BT-3	**understand**
2.	Comparative statement of static and dynamic effects of wind on structures	BT-1	**Remember**
3.	Explain in details about wind force on stiff building (QUASI-STATIC method)	BT-1	**Remember**
4.	A reinforced, framed building is 45m X 15m in plan and 60m in height consisting of storey 4m height. It is braced in the longitudinal direction by rigid frame action and by a reinforced concrete infill wall in the transverse direction. Determine the design wind force on the framed building. Assume that the building is situated in terrain category 3 with basic wind speed of 50m/s in a fully developed velocity profile	BT-4	**Creating**

UNIT-2 WIND TUNNEL STUDIES

Wind Tunnel Studies, Types of tunnels, - Prediction of acceleration – Load combination factors –Wind tunnel data analysis – Calculation of Period and damping value for wind design – Modelingrequirements, Aero dynamic and Aero-elastic models.

PART - A

Q.No	Questions	BT	Competence
1.	Writethe different types of wind tunnels.	BT-3	**understand**
2.	List the advantages of wind tunnel studies.	BT-1	**Remember**
3.	What is the difference between prototype and a model?	BT-1	**Remember**
4.	List down the types of tunnel model in study.	BT-4	**Creating**
5.	Differentiate aerodynamic and aero elastic models.	BT-2	**Application**
6.	Distinguish the main difference between subsonic and supersonic wind tunnels?	BT-2	**Application**
7.	Contrast between transonic and hypersonic wind tunnels.	BT-2	**Remember**
8.	Briefly explain the application of wind tunnels.	BT-5	**understand**
9.	State the requirements for modeling of structures?	BT-1	**understand**
10.	Classify the types of wind tunnel based on shape.	BT-6	**Application**
11.	Define Reynolds number.	BT-1	**Creating**
12.	List out the eight variable on which the behavior of a structure is determined.	BT-6	**Remember**
13.	Determine the classification of tunnel balance.	BT-1	**Analyze**
14.	What are the three main controls for the wind tunnels?	BT-3	**Analyze**
15.	How do you calculate the rational number?	BT-3	**Evaluate**

16.	What is called tunnel balance?	BT-4	**Remember**
17.	Explain the types of mountains for structural tests in wind tunnel?	BT-2	**Analyze**
18.	Which method of circuits to be used for the asses the wind data? Justify your answer.	BT-4	**understand**
19.	Assess the losses in supersonic tunnel.	BT-5	**Remember**
20.	Enumerate the merits and demerits of open circuit and closed circuit wind tunnel.	BT-1	**Evaluate**
	PART - B		
1.	Explain in details about the different types of wind tunnels with neat sketches.	BT-3	**understand**
2.	Elaborate the modeling requirements for aero dynamic and aero elastic models.	BT-1	**Remember**
3.	Describe the different types of models used in wind tunnel studies.	BT-1	**Remember**
4.	Explain the procedure to calculate the fundamental period of vibration and damping value for wind design.	BT-4	**Creating**
5.	What are the various types of wind tunnels? How to simulate the ground roughness inside the wind tunnels? Explain with neat sketches.	BT-2	**Application**
6.	Explain in details about the consideration in modeling and various types of models.	BT-2	**Application**
7.	Explain notes on; i) Describe how you will carry out the wind tunnel studies. ii) Explain the procedure for prediction of acceleration	BT-2	**Remember**
8.	Estimate the details of wind tunnel data analysis procedure.	BT-5	**understand**
9.	List out the wind tunnel experiments with neat sketch.	BT-1	**understand**
10.	What are the modeling requirements for a wind tunnel experiment, explain about aero dynamic and aero elastic models.	BT-6	**Application**
11.	Explain the dynamic similarity between a wind tunnel model and the prototype to be flight-tested. What are the essential conditions to be satisfied for the results to be carried from the model to the prototype? Are there any limitations or preconditions involved?	BT-1	**Creating**
12.	What is understood by the term low speed wind tunnel in aerodynamic testing? Describe with brief details through sketches and plots, various types of low speed wind tunnels based upon the details of the flow intest section.	BT-6	**Remember**
13.	Describe in details about: i) Vortex shedding ii) Interference	BT-1	**Analyze**
14.	Explain the techniques used for Turbulence measurements in a wind tunnel	BT-3	**Analyze**

PART-C			
1.	Briefly discuss the scale effects of similarities.	BT-1	**Remember**
2.	Explain the Buckingham's pi theorem.	BT-1	**Remember**
3.	Briefly explain the measurement of pressure, velocity and force in a wind tunnel.	BT-4	**Creating**
4.	Recent study report on: i) Aerodynamic model ii) Elastic modal	BT-2	**Application**

UNIT-3 EFFECT OF WIND ON STRUCTURES

Classification of structures – Rigid and Flexible – Effect of wind on structures - Static and dynamiceffects on Tall buildings – Chimneys.

PART - A

Q.No	Questions	BT Level	Competence
1.	Write down the Advantages and disadvantages of modal analysis?	BT-6	**Evaluate**
2.	Explain about the 3 methods evolved to damp out wind vortex exciaions.	BT-4	**Remember**
3.	State the self-generated oscillation.	BT-1	**Remember**
4.	Point out the random gust?	BT-4	**understand**
5.	Discover the concept of resonance.	BT-2	**Remember**
6.	Give the characteristics of damping?	BT-2	**Analyze**
7.	What are the effects of wind on structures?	BT-1	**Analyze**
8.	Debate the limitations of interference effect?	BT-5	**understand**
9.	Differentiate flexible and rigid building.	BT-4	**Analyze**
10.	Write down the basic type of structure.	BT-6	**Creating**
11.	Differentiate tall building medium rise building and low rise building.	BT-2	**Evaluate**
12.	Define vortex effect.	BT-1	**Creating**
13.	Compare static effect and dynamic effect on structure.	BT-5	**Remember**
14.	State the various forces that act on chimney.	BT-1	**understand**
15.	Define tall building?	BT-3	**Remember**
16.	What are the forces to be considered in the design of chimney?	BT-1	**Application**
17.	Write down the load combination on tall building.	BT-2	**Application**
18.	List out the advantages and disadvantages of modal analysis.	BT-1	**Application**
19.	What are the effect of wind loading on tall building	BT-3	**understand**

20.	Sketch the various classifications of structures.	BT-3	**Remember**
	PART - B		
1.	Elaborate the static and dynamic effect of wind forces on tall building.	BT-6	**Evaluate**
2.	A building with plan dimension of 15m X 25m and 5 storeys. Each storey height is 3m. The fundamental frequency of the building is 1.1Hz and it is subjected to a wind speed of 120mph perpendicular to the longer dimension of the building. The building can accommodate more than 300 people and it is located in an urban area. Calculate the wind pressure on the building according to IS category is 2.	BT-4	**Remember**
3.	Explain the behavior of rigid and flexible building subjected to wind forces in detail.	BT-1	**Remember**
4.	Explain in detail about the effects of wind forces on chimneys with neat sketches.	BT-4	**understand**
5.	Explain the behavior of flexible structures subjected to wind forces with neat sketches.	BT-2	**Remember**
6.	An 8-storey office building with 20 X 40 m plan dimension is with 4m floor to floor height. The fundamental frequency of the building is 1Hz; The number of occupancy in the building is more than 300. Building subject to a wind speed of 100 mph perpendicular to the longer dimension of the building. The building is located in an urban region. Calculate the wind pressure on the building using UBC-97.	BT-2	**Analyze**
7.	How will you design rigid and flexible structures for wind effects? Explain.	BT-1	**Analyze**
8.	What are the static and dynamic effects on tall building subjected to wind forces? How will you evaluate? Explain.	BT-5	**understand**
9.	Write down the effect of wind on chimney.	BT-4	**Analyze**
10.	Explain the following : i. Pneumatic high rise building. ii. ii. Space frame in high rise buildings	BT-6	**Creating**
11.	Write short notes on 1) Cliff and escarpment 2) hill and ridge	BT-2	**Evaluate**
12.	Explain about general theory of wind effects of structures.	BT-1	**Creating**
13.	Explain step by step procedure to find out wind pressure on structure as per codal provisions.	BT-5	**Remember**

14.	(i) Obtain an expression for a combined effect of self-weight, wind and temperature stresses for the section on the leeward side of a chimney shell. (ii) Discuss how the temperature gradient is affected in the inner and outer faces of RC chimney.	BT-1	**understand**
PART-C			
1.	Explain in detail about the second order effects of gravity of loading.	BT-4	**Remember**
2.	Study of high rise residential building in Indian cities (a case study – Chennai city)	BT-1	**Remember**
3.	List out the materials used in the contraction of the high rise building in India.	BT-4	**understand**
4.	Write short notes on 1)suspended structures 2) Core structures. 3) Hybrid analysis	BT-2	**Remember**

UNIT IV DESIGN OF SPECIAL STRUCTURES			
Design Of Structures For Wind Loading – As Per IS, ASCE And NBC Code Provisions – Design Of Tall Buildings – Chimneys – Transmission Towers And Steel Monopoles– Industrial Sheds.			
PART - A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	What is the purpose of transmission line tower?	BT-1	**Remember**
2.	Define solidity ratio.	BT-1	**Remember**
3.	Indicate the stresses developed in the steel chimneys.	BT-2	**Remember**
4.	Why force coefficients are considered in calculating the wind force on the transmission line towers.	BT-2	**Remember**
5.	Summarizerigid and flexible structures.	BT-5	**Application**
6.	Discriminate the various forces to be considered for the design of roof truss in an industrial building?	BT-4	**Analyze**
7.	Give an outline about effect of wind loading on chimneys.	BT-4	**understand**
8.	Outline the loads considered for tall building and roofs.	BT-4	**understand**
9.	Draw an industrial shed and mark its important parts.	BT-3	**Remember**
10.	Write the formula for design wind speed.	BT-6	**Creating**

11.	Define imposed loads, how are they classified.	BT-3	**Application**
12.	List the components of steel monopoles.	BT-1	**understand**
13.	List out the factors should considered for design of steel monopoles	BT-1	**understand**
14.	Formulate the forces coefficients for structure.	BT-6	**Creating**
15.	Generalize the formulae for pressure coefficients for components in a building	BT-2	**Evaluate**
16.	Write the formulae for the gust factor.	BT-1	**Remember**
17.	Describe how terrains are classified?	BT-2	**Evaluate**
18.	List the uses of bluff body?	BT-1	**Analyze**
19.	Analyze the loads due to impose deformations?	BT-3	**Analyze**
20.	List out the formulate for the factored design load.	BT-5	**Application**
	PART - B		
1.	Explain the step by step procedure in design of chimneys subjected to wind loads.	BT-1	**Remember**
2.	Explain the step by step procedure in design of transmission line towers.	BT-1	**Remember**
3.	Calculate the wind pressure acting on a chimney of height 72m above the formation. The diameter of the chimney is 3m. the thickness of the wall is 100mm. the topography at the site is almost flat and at the location, the terrain category is 2	BT-2	**Remember**
4.	Explain the procedure to design an industrial shed with fink type roof truss for a span of 15m.	BT-2	**Remember**
5.	Calculate the wind pressure acting on a building of height 3m and plan dimension 10m x 10m. The basic wind speed in the location is 50 mph and the terrain category is 2.	BT-5	**Application**
6.	Explain the procedure to design a lattice tower located on a hilly region in Tamilnadu, by considering the relevant data for wind velocity.	BT-4	**Analyze**
7.	A hoarding of 2.5m x 1.5m at height with its center 2.5m above ground level is to be erected to Delhi. The basic wind speed at the location is 65 mph and the terrain category is 1.calculate the wind pressure on the hoarding as per IS code provision.	BT-4	**understand**
8.	Describe the procedure to design a TV tower situated at a coastal region in Kerala, considering the regional wind velocity and other relevant data.	BT-4	**understand**
9.	List out the design of structures as per ASCE and NBC codal provisions and compare.	BT-3	**Remember**
10.	Explain the effect on tall building with neat sketches.	BT-6	**Creating**
11.	Describe in details about the wind effect on roofing with neat sketches.	BT-3	**Application**

12.	Summarize the effect of wind driven rain on cladding	BT-1	**understand**
13.	Detailed design procedure for compute the wind pressure for the tall buildings.	BT-1	**understand**
14.	Design a purlin for a roof truss having the following data. Span of the truss= 6m Spacing of truss= 3m c/c Inclination of roof= 30^0 Spacing of purlin= 2m c/c Wind pressure= 1.5 KN/m^2, roof coverage- A.C sheet, sheet weighing 200N/m^2, provide a channel section purlin.	BT-6	**Creating**
PART-C			
1.	Analyze the wind effect on cooling towers with neat sketches.	BT-1	**Remember**
2.	List out the design of structures as per ASCE and IS codal provisions and compare.	BT-2	**Remember**
3.	Study of high rise residential building in Indian cities (a case study – Chennai city)	BT-2	**Remember**
4.	Study of high rise residential building in Indian cities (a case study –pune city)	BT-5	**Application**

UNIT V CYCLONE EFFECTS

Cyclone Effect On – Low Rise Structures – Sloped Roof Structures - Tall Buildings. Effect Of Cyclone On Claddings – Design Of Cladding – Use Of Code Provisions In Cladding Design – Analytical Procedure And Modeling Of Cladding.

PART - A

Q.No	Questions	BT	Competence
1.	Summarize low raise structures.	BT-2	**Remember**
2.	Point out the effects of wind on claddings.	BT-4	**Evaluate**
3.	List basic assumptions in analyzing of modeling in cladding structures.	BT-1	**Remember**
4.	Discus aboutfactors to be considered in the design of cladding	BT-2	**understand**
5.	Give the characteristics of cyclone effect on structures.	BT-2	**Remember**
6.	Write a short note on the cyclone.	BT-5	**Remember**
7.	Show the difference between cyclone and wind.	BT-3	**Remember**

8.	Write the components of sloped roof structures.	BT-6	**Remember**
9.	What do you meant by low raise structures? Give examples	BT-1	**understand**
10.	Draw the components of cladding.	BT-3	**Analyze**
11.	How to you calculate design wind speed.	BT-1	**Evaluate**
12.	Differentiate between low raise building and tall building.	BT-4	**understand**
13.	Discuss the effect of wind loading in the design of cladding in a high raise building?	BT-2	**Application**
14.	Compile design factors for tall building.	BT-6	**Analyze**
15.	Define cladding& write it uses.	BT-1	**Creating**
16.	Analyze the effect of cyclone on structural cladding.	BT-4	**understand**
17.	Narrate the modeling requirement of cladding.	BT-5	**Application**
18.	Discuss about the codal provisions used for designing a cyclone effect of structures	BT-1	**Analyze**
19.	Difference between basic wind speed and design wind speed.	BT-1	**Creating**
20.	Sketch the detailing of sloped roof structures.	BT-3	**Application**
	PART-B		
1.	Explain in details about the effect of tall building due to cyclone and elaborate the effective measures to be taken.	BT-1	**Remember**
2.	Explain the analytical procedure and modeling of cladding.	BT-2	**understand**
3.	Describe elaborately the steps involved in the design of structures for wind loading.	BT-2	**Remember**
4.	Illustrate the state and dynamic effects on tall buildings.	BT-5	**Remember**
5.	Discuss the effect of cyclone on (i) Low raise structures and (ii) In tall buildings	BT-3	**Remember**
6.	Briefly describe the analytical and codal provisions in design of cladding.	BT-6	**Remember**
7.	Explain in detail about the various effects on low raise structures due to cyclone and their preventive measures.	BT-1	**understand**
8.	Explain the procedure to design a cladding for commercial low raise building using the codal provisions.	BT-3	**Analyze**
9.	Explain the detailed design procedure for cladding in a tall building.	BT-1	**Evaluate**
10.	List out the effect of cyclones in sloped roof structures.	BT-4	**understand**

11.	Describe in detail the static and dynamic effects on tall buildings.	BT-2	**Application**
12.	Illustrate the cyclone effects on low raise structures.	BT-1	**Remember**
13.	Differentiate the cyclone effect on low raise structures and sloped roof structures.	BT-2	**understand**
14.	Explain the analytical procedure of modeling of cladding and write down the codal provisions in the design of cladding.	BT-2	**Remember**
	PART-C		
1.	Describe in detail the static and dynamic effects on tall buildings.	BT-3	**Remember**
2.	Explain the detailed design procedure for cladding in a tall building.	BT-6	**Remember**
3.	Discuss the effect of cyclone on (i) Low raise structures and (ii) In tall buildings	BT-1	**understand**
4.	Case study on cyclone effect of low raise building and tall building	BT-3	**Analyze**