# SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

## DEPARTMENT OF PHYSICS

## QUESTION BANK

**II SEMESTER**

**PH3221-PHYSICS FOR CIVIL ENGINEERING**

**Academic Year 2024 – 2025**

*Prepared by*

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**SUBJECT : PH3221-PHYSICS FOR CIVIL ENGINEERING**

**SEM / YEAR: II SEM/AY-2024 – 2025**

## UNIT I - THERMAL PERFORMANCE OF BUILDINGS

Principles of heat transfer - fenestrations - thermal conductivity - conduction through compound media: series and parallel - spherical, cylindrical shell method - conductivity of rubber tube - thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings - thermal comfort-indices of thermal comfort-shading devices.

### PART – A

| Q.No | Questions | BTL | Competence |
|---|---|---|---|
| 1. | What is the basic principle of heat transfer? | BTL 1 | Remembering |
| 2. | Classify the types of heat transfer. | BTL 1 | Remembering |
| 3. | What is conduction? | BTL 1 | Remembering |
| 4. | What is convection? | BTL 1 | Remembering |
| 5. | What is radiation? | BTL 1 | Remembering |
| 6. | Define thermal conductuivity. | BTL 2 | Understanding |
| 7. | Write the principle of spherical shell method. | BTL 1 | Remembering |
| 8. | Give the principle of cylindrical shell method. | BTL 2 | Understanding |
| 9. | What is the principle of conductivity of rubber tube? | BTL 1 | Remembering |
| 10. | Define fenestration. | BTL 1 | Remembering |
| 11. | What are the three main components of fenestration? | BTL 1 | Remembering |
| 12. | What is glazing? | BTL 1 | Remembering |
| 13. | What is thermal insulation? | BTL 1 | Remembering |
| 14. | What are thermal insulating properties? | BTL 2 | Understanding |
| 15. | List any two properties of thermal insulating materials. | BTL 1 | Remembering |
| 16. | Define heat gain and heat loss. | BTL 1 | Remembering |
| 17. | What is meant by thermal performance of building? | BTL 1 | Remembering |
| 18. | Mention two factors which affect the thermal performance of buildings. | BTL 2 | Understanding |
| 19. | Write the significance of thermal comfort. | BTL 2 | Understanding |
| 20. | Define thermal indices. | BTL 1 | Remembering |
| 21. | What is R-value? | BTL 2 | Understanding |
| 22. | Define solar radiation. | BTL 1 | Remembering |
| 23. | How are shading devices classified? | BTL 2 | Understanding |
| 24. | Mention the uses of shading devices. | BTL 2 | Understanding |

### PART – B

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|---|---|---|---|
| 1. | Derive the expressions of heat conduction through series and parallel materials. (16) | BTL 3 | Applying |
| 2. | Derive the derivation of series and parallel materials in conduction of heat. (16) | BTL 3 | Applying |
| 3. | Describe the conduction of heat through the material which are connected in series. (16) | BTL 3 | Applying |

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|---|---|---|---|
| 4. | Explain the spherical shell method with neat diagram. (16) | BTL 3 | Applying |
| 5. | Describe the spherical shell method. (16) | BTL 3 | Applying |
| 6. | Describe the cylindrical shell method of determining the thermal conductivity. (16) | BTL 3 | Applying |
| 7. | Explain the cylindrical shell method and find its thermal conductivity. | BTL 3 | Applying |
| 8. | Explain how thermal conductivity can be measured using rubber tube method. (16) | BTL 4 | Analysing |
| 9. | Explain the thermal insulation of the buildings. (16) | BTL 3 | Applying |
| 10. | (i) Give importance of thermal insulation? Name any two thermal insulating materials. (3)<br>(ii) Discuss the factors that affect the thermal performance of buildings with example. (13) | BTL 3 | Applying |
| 11. | Discuss the factors which affect the thermal performance of buildings. (16) | BTL 3 | Applying |
| 12. | Explain how heat gain and heat loss estimations are carried out for a building. (16) | BTL 4 | Analysing |
| 13. | Discuss heat gain and heat loss estimation in the components of buildings. (16) | BTL 3 | Applying |
| 14. | Explain the function, importance and types of shading devices. (16) | BTL 3 | Applying |
| 15. | Describe the different types of shading devices. (16) | BTL 3 | Applying |
| 16. | Explain the types of shading devices. (16) | BTL 3 | Applying |
| 17. | Describe the various methods of thermal insulation which are used to keep our homes cool inside when there is warm temperature outside and vice versa. (16) | BTL 4 | Analysing |

## UNIT II - VENTILATION AND ARCHITECTURAL ACOUSTICS

Principles of natural ventilation - ventilation measurements - Window type air conditioner -Protection against fire to be caused by A.C. systems - classification of sound - decibel -Weber-Fechner law - Sabine's formula (reverberation time) - derivation using growth and decay method - absorption coefficient and its determination - factors affecting acoustics of buildings and their remedies - methods of sound absorptions - absorbing materials - noise and its measurements - impact of noise in multi-storey buildings.

### PART – A

| Q. No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | What is ventilation? | BTL 1 | Remembering |
| 2. | Classify natural ventilation. | BTL 1 | Remembering |
| 3. | What are the factors affecting ventilation? | BTL 1 | Remembering |
| 4. | What is air filtration? | BTL 1 | Remembering |
| 5. | What is meant by air-conditioning? | BTL 2 | Understanding |
| 6. | What is window air- conditioner? | BTL 1 | Remembering |
| 7. | Write any two precautions to prevent fire caused by AC systems. | BTL 2 | Understanding |
| 8. | Classify the sound waves based on frequency. | BTL 1 | Remembering |
| 9. | What is loudness? | BTL 2 | Understanding |
| 10. | Differentiate loudness and intensity. | BTL 2 | Understanding |
| 11. | State Weber-Fechner law. | BTL 2 | Understanding |
| 12. | Define sound intensity level. | BTL 2 | Understanding |
| 13. | What is decibel? | BTL 1 | Remembering |
| 14. | The intensity of sound by roaring of a lion at a distance of 5 m is 0.01 $Wm^{-2}$. Calculate intensity level in decibel. | BTL 3 | Applying |
| 15. | When the sound intensity is tripled, calculate the increase in the acoustic intensity level. | BTL 3 | Applying |
| 16. | What is reverberation? | BTL 1 | Remembering |
| 17. | Define reverberation time. | BTL 2 | Understanding |
| 18. | Mention any two factors which affect the acoustics of a building. | BTL 1 | Remembering |
| 19. | What is meant by focusing? | BTL 2 | Understanding |
| 20. | What is echelon effect? | BTL 2 | Understanding |
| 21. | What is a floating floor? | BTL2 | Understanding |
| 22. | What is structure borne noise? | BTL 1 | Remembering |
| 23. | What are the main causes of noise in multi-storeyed building? | BTL2 | Understanding |
| 24. | Mention the requirements for good acoustics of building. | BTL 1 | Remembering |

### PART -B

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|---|---|---|---|
| 1. | (i) What is natural ventilation? (3)<br>(ii) Explain the principle behind wind driven and stack ventilation mechanisms. (13) | BTL 4 | Analysing |

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| 2. | Explain the method of ventilation measurements in a building? (16) | BTL 4 | Analysing |
| 3. | How to design natural ventilation which is mainly used to control indoor air quality and also explain the ventilation measurements. (16) | BTL 4 | Analysing |
| 4. | Explain the window type air conditioner system. (16) | BTL 4 | Analysing |
| 5. | Discuss the air conditioning systems for different types of buildings and explain how fire caused by AC system can be protected. (16) | BTL 3 | Applying |
| 6. | Describe the construction and working of window type air conditioner. (16) | BTL 3 | Applying |
| 7. | Derive Sabine's formula for reverberation time using growth and decay method. (16) | BTL 3 | Applying |
| 8. | (i) Derive expression for energy density inside a hall. (8)<br>(ii) Deduce Sabine's formula for the reverberation time of the hall. (8) | BTL 3 | Applying |
| 9. | Derive Sabine's mathematical relation for reverberation time. (16) | BTL 3 | Applying |
| 10. | Explain the various factors which affect the architectural acoustics of a building and write their remedies. (16) | BTL 4 | Analysing |
| 11. | Discuss the terms, reverberation, loudness, resonance, echelon effect, focusing that affect the acoustics in hall. (16) | BTL 3 | Applying |
| 12. | Explain the various factors that affect acoustics of buildings. What are their remedies? (16) | BTL 3 | Applying |
| 13. | (i) Describe the methods of sound absorption. (8)<br>(ii) Derive an expression for measuring the absorption coefficient of a material. (8) | BTL 3 | Applying |
| 14. | Explain the different types of sound absorbing materials used in a building. (16) | BTL 4 | Analysing |
| 15. | Describe different types of sound absorbers used in designing a buildingwith good acoustical properties. (16) | BTL 3 | Applying |
| 16. | Write a note on noise measurements and explain the impact of noise in multi-storeyed buildings. (16) | BTL 3 | Applying |
| 17. | Explain the different types of noises in buildings. (16) | BTL 4 | Analysing |

## UNIT III - LIGHTING DESIGNS

Radiation quantities - spectral quantities - relationship between luminescence and radiant quantities - photometry: cosines law, inverse square law. Vision - photobic, mesophic, scotopic visions - Visual field glare - day light calculations - day light design of windows - use of models and artificial skies - principles of artificial lighting - types of light fixtures - supplementary artificial lighting.

### PART – A

| Q.No | Questions | BT Level | Competence |
|---|---|---|---|
| 1. | What is radiometry? | BTL1 | Remembering |
| 2. | Define radiant power. | BTL1 | Remembering |
| 3. | Define radiant intensity. | BTL1 | Remembering |
| 4. | Define irradiance. | BTL1 | Remembering |
| 5. | Define spectral radiant power. | BTL1 | Remembering |
| 6. | What is luminous flux and give its unit? | BTL1 | Remembering |
| 7. | Define luminous intensity. | BTL2 | Understanding |
| 8. | Define candela. | BTL1 | Remembering |
| 9. | Define intensity of illumination. | BTL1 | Remembering |
| 10. | What is photometry? | BTL1 | Remembering |
| 11. | State inverse square law in photometry. | BTL2 | Understanding |
| 12. | Define Lambert's Cosines law. | BTL1 | Remembering |
| 13. | What is meant by photopic vision? | BTL2 | Understanding |
| 14. | What is meant by mesopic vision? | BTL2 | Understanding |
| 15. | What is meant by scotopic vision? | BTL2 | Understanding |
| 16. | What is meant by glare? | BTL1 | Remembering |
| 17. | Mention different types of glare. | BTL2 | Understanding |
| 18. | List any two methods to reduce glare. | BTL2 | Understanding |
| 19. | What is meant by day light factor? | BTL2 | Understanding |
| 20. | Write the use of models in daylight calculation. | BTL2 | Understanding |
| 21. | What are artificial sky models? | BTL1 | Remembering |
| 22. | What are the forms of artificial sky? | BTL1 | Remembering |
| 23. | What is the purpose of supplementary artificial lighting? | BTL1 | Remembering |
| 24. | Mention any two artificial light sources. | BTL2 | Understanding |
| | **PART – B** | | |
| 1. | Discuss the different radiometric quantities. (16) | BTL 3 | Applying |
| 2. | Discuss the different photometric quantities. (16) | BTL 3 | Applying |
| 3. | Describe the relation between radiant and luminous characteristics of radiation. (16) | BTL 3 | Applying |
| 4. | (i) State Cosines law and derive an expression for intensity of illumination. (16)<br>(ii) Show that luminance on a surface is inversely proportional to the square of the distance. (16) | BTL 3 | Applying |
| 5. | (i) Derive Lambert's Cosine law for intensity of illumination. (8)<br>(ii) Derive inverse square law in photometry. (8) | BTL3<br>BTL3 | Applying<br>Applying |

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| 6. | Explain the following (a) photopic<br>(b) mesopic<br>(c) scotopic visions. (5+5+6) | BTL 4 | Analysing |
| 7. | Explain the three ranges of human vision adaptation level. (16) | BTL 4 | Analysing |
| 8. | Write notes on<br>(i) Visual field glare (8)<br>(ii) Day light calculation & day light factor. (8) | BTL 3 | Applying |
| 9. | Write a short note on visual field glare and explain the types of glare and its remedies. (16) | BTL 3 | Applying |
| 10. | Discuss daylight calculation and daylight design of windows. (16) | BTL 3 | Applying |
| 11. | Explain the day light design and measurements in the buildings. (16) | BTL 4 | Analysing |
| 12. | Explain the use of building models and artificial skies in estimating daylight factor and deciding on artificial lighting. (16) | BTL 4 | Analysing |
| 13. | Discuss the principles and techniques involved in artificial lighting. (16) | BTL 3 | Applying |
| 14. | Discuss about ambient, task and accent lighting in buildings. (16) | BTL 3 | Applying |
| 15. | Recent years have seen a huge shift away from traditional incandescent filament-type light bulbs to more energy-efficient alternatives. Explain the sources and the types of light source that is produced by electrical means. (16) | BTL 3 | Applying |
| 16. | Describe supplementary artificial lighting. (16) | BTL 3 | Applying |
| 17. | Explain supplementary artificial lighting. (16) | BTL 4 | Analysing |

**UNIT IV - NEW ENGINEERING MATERIALS**

Composites: Fibre-reinforced plastics (FRP) and fiber-reinforced metals (FRM) - Metallic glasses - melt spinning method - properties and applications - Shape memory alloys - characteristics and applications - Ceramics - manufacturing methods - Slip casting - Isostatic pressing - properties and applications - Nanomaterials - Top-down and bottom-up approaches - structural applications.

**PART – A**

| Q.No | Questions | BTL Level | Competence |
|---|---|---|---|
| 1. | What are composite materials? | BTL2 | Understanding |
| 2. | List the types of composites based on matrix materials. | BTL1 | Remembering |
| 3. | Name the types of fibre reinforced plastics. | BTL2 | Understanding |
| 4. | What are the types of composites based on the matrix materials? | BTL2 | Understanding |
| 5. | Mention the role of matrix in composites. | BTL2 | Understanding |
| 6. | What is the role of reinforcement in composites? | BTL2 | Understanding |
| 7. | What are the limitations of composites? | BTL2 | Understanding |

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|---|---|---|---|
| 8. | Write any two applications of composites. | BTL1 | Remembering |
| 9. | What are metallic glasses? | BTL1 | Remembering |
| 10. | What is glass transition temperature in metallic glasses? | BTL2 | Understanding |
| 11. | Why metallic glasses are used as transformer core materials? | BTL1 | Remembering |
| 12. | What are shape memory alloys? | BTL2 | Understanding |
| 13. | Define pseudo elasticity in SMA. | BTL2 | Understanding |
| 14. | What are ceramic materials? | BTL1 | Remembering |
| 15. | Distinguish crystalline and non-crystalline ceramics. | BTL2 | Understanding |
| 16. | Write any two mechanical properties of ceramics. | BTL1 | Remembering |
| 17. | Define slip casting. | BTL2 | Understanding |
| 18. | What are bonded ceramics? | BTL2 | Understanding |
| 19. | What is meant by hot isostatic pressing? | BTL1 | Remembering |
| 20. | Write any two applications of ceramics. | BTL2 | Understanding |
| 21. | What are ferromagnetic ceramics? | BTL2 | Understanding |
| 22. | What is meant by high alumina ceramics? | BTL2 | Understanding |
| 23. | What is nanomaterials? | BTL2 | Understanding |
| 24. | List any two structural applications. | BTL2 | Understanding |

**PART – B**

| | | | |
|---|---|---|---|
| 1. | Classify the materials based on reinforcement techniques and also explain the types based on the matrix materials. (16) | BTL 3 | Applying |
| 2. | Explain<br>(i) Fibre Reinforced Plastics(FRP) (8)<br>(ii) Fibre Reinforced Metals (FRM) (8) | BTL 4 | Analysing |
| 3. | Explain the properties and applications of fiber reinforced plastics. (16) | BTL 4 | Analysing |
| 4. | Explain the preparation and properties of metallic glasses. (16) | BTL 4 | Analysing |
| 5. | What are the types of metallic glasses and explain how it is prepared by meltspinning technique. (16) | BTL 3 | Applying |
| 6. | (i) What are the types of shape memory alloys? Explain with neat diagram their characteristics. (10)<br>(ii) List out the applications of shape memory alloys. (6) | BTL 3 | Applying |
| 7. | Explain the characteristics and applications of shape memory alloys. (16) | BTL 4 | Analysing |
| 8. | Describe the types, properties and applications of shape memory alloys. (16) | BTL 3 | Applying |
| 9. | Discuss the various properties and applications of ceramics in the construction engineering. (16) | BTL 3 | Applying |
| 10. | Discuss the manufacturing process of ceramics and its applications. (16) | BTL 3 | Applying |

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|---|---|---|---|
| 11. | Explain different ceramic forming processes. (16) | BTL 4 | Analysing |
| 12. | With neat diagrams, explain<br>(i) Slip casting<br>(ii) Isostatic pressing<br>(iii)Gas pressure bonding. (5+5+6) | BTL 3 | Applying |
| 13. | Explain thermal, mechanical, electrical and chemical properties of ceramic materials. (16) | BTL 4 | Analysing |
| 14. | Write note on<br>(i) Ferroelectric ceramics<br>(ii) Ferro magnetic ceramics<br>(iii)High alumina ceramics. (6+5+5) | BTL 3 | Applying |
| 15. | Explain the properties and applications of high alumina ceramics. (16) | BTL 4 | Analysing |
| 16. | Explain how the ceramic materials are classified and describe its manufacturing methods? (16) | BTL 4 | Analysing |
| 17. | (i) Explain the preparation of nano materials (10)<br>(ii) Give the structural application of nano materials (6) | BTL 3 | Applying |

## UNIT V - NATURAL DISASTERS

Seismology and Seismic waves - Earthquake ground motion - Basic concepts and estimation techniques - site effects - Probabilistic and deterministic Seismic hazard analysis - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials, fire safety regulations and firefighting equipment - Prevention and safety measures.

### PART – A

| Q.No | Questions | BTL | Competence |
|---|---|---|---|
| 1. | What is meant by seismic waves? | BTL2 | Understanding |
| 2. | What are P - waves and S-waves? | BTL1 | Remembering |
| 3. | What is earthquake? | BTL1 | Remembering |
| 4. | List the types of earthquake based on depth of focus. | BTL2 | Understanding |
| 5. | Define epicentre of an earthquake. | BTL1 | Remembering |
| 6. | Define intensity of an earthquake. | BTL1 | Remembering |
| 7. | What are the causes of earthquake? | BTL2 | Understanding |
| 8. | Mention few units for the measurement of earthquakes. | BTL2 | Understanding |
| 9. | What is Seismic Hazard Analysis? | BTL1 | Remembering |
| 10. | What are primary waves? | BTL1 | Remembering |
| 11. | Whtat are secondary waves? | BTL1 | Remembering |
| 12. | Mention the most important factors affecting seismic hazard at a location. | BTL2 | Understanding |
| 13. | What are the types of surface waves? | BTL1 | Remembering |
| 14. | What is Probabilistic Seismic Hazard Analysis? | BTL2 | Understanding |
| 15. | Write the four steps in Probabilistic Seismic Hazard Analysis. | BTL2 | Understanding |
| 16. | What are the steps in DSHA? | BTL1 | Remembering |
| 17. | What are cyclones? | BTL1 | Remembering |
| 18. | What are the categories of cyclone based on wind speeds and their capacity to cause damage? | BTL1 | Remembering |
| 19. | What is flood hazard? | BTL1 | Remembering |
| 20. | Name the types of floods. | BTL2 | Understanding |
| 21. | List the methods of flood prevention. | BTL2 | Understanding |
| 22. | What is fire hazards and list the types of fire hazards? | BTL2 | Understanding |
| 23. | What are fire extinguishers? Give examples. | BTL2 | Understanding |
| 24. | List the fire-proofing materials for buildings. | BTL1 | Remembering |

### PART – B

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|---|---|---|---|
| 1. | With necessary diagrams, explain different types of body waves and surface waves in seismology. (16) | BTL 3 | Applying |
| 2. | Explain the occurrence of earthquake ground motion and its estimation technique. (16) | BTL 4 | Analysing |
| 3. | Describe earthquake in terms of p-waves, s-waves and explain its various parameters. (16) | BTL 3 | Applying |
| 4. | Discuss the various earthquake hazards and explain the disaster mitigation after earthquake. (16) | BTL 3 | Applying |
| 5. | Discuss earthquake ground motion with types, intensity and magnitude. (16) | BTL 3 | Applying |
| 6. | Explain deterministic seismic hazard analysis and probabilistic seismic hazard analysis. (16) | BTL 4 | Analysing |
| 7. | Discuss the Deterministic Seismic Hazard Analysis (DSHA). (16) | BTL 3 | Applying |
| 8. | What is DSHA? Explain the DSHA. (16) | BTL 3 | Applying |
| 9. | (i) How cyclone is formed? (8)<br>(ii) Explain the different types of cyclone. (8) | BTL3<br>BTL3 | Applying<br>Applying |
| 10. | Explain cyclone hazard with cause and its effects. (16) | BTL 4 | Analysing |
| 11. | Describe the hazards of cyclone. | BTL 3 | Applying |
| 12. | Explain flood hazards. Mention the effects and methods of flood prevention. (16) | BTL 4 | Analysing |
| 13. | Describe the types, causes and effects of flood hazards. (16) | BTL 3 | Applying |
| 14. | Discuss about fire hazards and guidance on preventive measure. (16) | BTL 3 | Applying |
| 15. | Describe about fire proofing materials. (16) | BTL 3 | Applying |
| 16. | Explain the operation of different types of fire extinguishers equipments. (16) | BTL 4 | Analysing |
| 17. | (i) Explain about the firefighting equipments. (10)<br>(ii) Write a note on fire safety regulations. (6) | BTL4<br>BTL3 | Analysing<br>Applying |