CBCS SCHEME



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BPHYC102/202

# First/Second Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

## Applied Physics for Civil Engineering Stream

Time: 3 hrs. Max. Marks: 100

***Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.***
***2. VTU Formula Hand Book is permitted.***
***3. M : Marks , L: Bloom's level , C: Course outcomes.***

| | | Module – 1 | M | L | C |
|---|---|---|---|---|---|
| Q.1 | a. | Define simple harmonic motion. Give example. Write the differential equation for SHM and explain the terms. | 05 | L2 | CO1 |
| | b. | With a neat diagram, explain the construction and working of Reddy tube and hence mention any four applications of shock waves. | 10 | L2 | CO1 |
| | c. | A free particle is executing SHM in a straight line. The maximum velocity it attains during any oscillation is 62.8 m/s. Find the frequency of oscillation if its amplitude is 0.5 m. | 05 | L3 | CO3 |
| | | **OR** | | | |
| Q.2 | a. | What are forced oscillations? Derive the expression for amplitude of vibration of a body undergoing forced vibrations. | 10 | L2 | CO1 |
| | b. | Define Mach number and hence give the classification of waves on the basis of Mach number. | 05 | L2 | CO1 |
| | c. | A vibrating system of natural frequency 500 CPS is forced to vibrate with a periodic force/unit mass of amplitude $100 \times 10^{-5}$ N/kg in the presence of a damping/unit mass of $0.01 \times 10^{-3}$ rad/s. Calculate the maximum amplitude of vibration of the system. | 05 | L3 | CO5 |
| | | **Module – 2** | | | |
| Q.3 | a. | Define elongation strain coefficient, compression strain coefficient and Poisson's ratio. Mention the equation for the same. | 06 | L2 | CO1 |
| | b. | Derive the relation between Young's modulus rigidity modulus and Poisson's ratio. | 09 | L2 | CO1 |
| | c. | Calculate the extension produced in a wire of length 2m and radius $0.013 \times 10^{-2}$ m due to a force of 14.7 N applied along its length. Given $Y = 2.1 \times 10^{11}$ $Nm^{-2}$. | 05 | L3 | CO5 |
| | | **OR** | | | |
| Q.4 | a. | What are beams? Discuss I – shaped beam in brief and hence mention its advantages, disadvantages and uses. | 09 | L2 | CO1 |
| | b. | What is fracture? Distinguish between brittle fracture and ductile fracture. | 06 | L2 | CO1 |
| | c. | Calculate the force required to produce an extension of 1 mm in steel wire of length 2m and diameter 1 mm. Given $Y = 2 \times 10^{11}$ $N/m^2$. | 05 | L3 | CO5 |
| | | **Module – 3** | | | |
| Q.5 | a. | Define reverberation time. Based on the assumptions made by Sabine deduce the expression for reverberation time. | 09 | L2 | CO2 |
| | b. | Discuss the remedial measures taken to improve the acoustic quality in the auditorium. | 06 | L2 | CO2 |
| | c. | A class room is having dimensions $20 \times 15 \times 5$ $m^3$. The reverberation time is 3.5 s. Calculate total absorption of surface and average absorption coefficient. | 05 | L3 | CO2 |

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| | | **OR** | | | |
| **Q.6** | **a.** | What is photometry? Explain different photometric quantities. | **07** | **L2** | **CO2** |
| | **b.** | Define absorption coefficient and absorption power. Explain in detail how the absorption coefficient of a material is measured using Sabine's formula. | **08** | **L2** | **CO2** |
| | **c.** | A lecture hall has volume 600 $m^3$. Its floor area is 120 $m^2$, walls area is 220 $m^2$ and ceiling area is 120 $m^2$. The walls, floor and ceiling are covered by materials of absorption coefficient 0.03, 0.06 and 0.80 respectively. Calculate reverberation time. | **05** | **L3** | **CO2** |
| | | **Module – 4** | | | |
| **Q.7** | **a.** | Expand the term LASER and discuss the interaction of radiation with matter. | **07** | **L2** | **CO3** |
| | **b.** | With neat diagrams, explain the construction and working of semiconductor LASER diagram. Mention the applications of semiconductor laser. | **08** | **L2** | **CO3** |
| | **c.** | A pulsed laser emits photons of wavelength 780 nm with average power/pulse 20 mW. Calculate the number of photons contained if each pulse duration is $10 \times 10^{-9}$ s. | **05** | **L3** | **CO3** |
| | | **OR** | | | |
| **Q.8** | **a.** | Define angle of acceptance and numerical aperture (NA). Derive the expression for NA. | **09** | **L2** | **CO3** |
| | **b.** | Explain the construction and working of fiber optic temperature sensor. | **06** | **L2** | **CO3** |
| | **c.** | An optical fiber has a core material with RI 1.55 and its cladding material has a RI of 1.50. Calculate its numerical aperture and angle of acceptance. | **05** | **L3** | **CO3** |
| | | **Module – 5** | | | |
| **Q.9** | **a.** | Discuss the classification of Earthquakes. | **09** | **L2** | **CO4** |
| | **b.** | Discuss the engineering structures to withstand earthquakes. | **06** | **L2** | **CO4** |
| | **c.** | Calculate the intensity of the earthquake of magnitude 6.5. Assume the base intensity is $I_0$. | **05** | **L3** | **CO4** |
| | | **OR** | | | |
| **Q.10** | **a.** | Describe various causes for land sliding. | **08** | **L2** | **CO4** |
| | **b.** | Write a note on forest fires and fire protection. | **07** | **L2** | **CO4** |
| | **c.** | The intensity of one earthquake is 100 times the intensity of the other. If the magnitude of the first earthquake is 8.9, estimate the magnitude of the other. | **05** | **L3** | **CO4** |

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