MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

IB. Tech– I Sem (MR20-2020-21 Admitted Students)
I Mid Examination Subjective Question Bank

Name of the Subject: Engineering Physics **Code: A0B12**
Branches: ME/CE/Min. E

Q.No.	Questions	Bloom's Taxonomy Level	CO
	Module I		
1.	Derive the equation of motion for a simple harmonic oscillator and obtain its solution?	Understanding	1
	OR		
2.	Deduce the expression for the total energy of a simple harmonic oscillator. Show that the total energy remains independent of time and displacement.	Understanding	1
3.	A particle executes simple harmonic motion which is given by the equation $x = 0.5 \cos(10\pi t + \pi/3)$. Where x is the displacement at time t. Assuming that all physical quantities involved in it are in SI units. Find (i) the amplitude (ii) the frequency (iii) the initial phase and (iv) the displacement at time t = 1 sec.	Applying	1
	OR		
4.	A massless spring of spring constant 10 N/m is suspended from a rigid support and carries a mass of 0.1 Kg at its lower end. The system is subjected to a resistive force $-R_m v$, where R_m is a constant and v is the velocity. It is observed that the system performs damped oscillatory motion and its energy decays to 1/e of its initial value in 50 Sec. What is the Q value of the oscillator?	Applying	1
5.	Form the equation of damped harmonic motion and obtain its solution.	Applying	1
	OR		
6.	Discuss the case of the light damped (underdamped) condition by using the solution of the damped harmonic oscillator.	Applying	1
7.	Investigate the conditions of heavy damping and critical damping by using the solution of the damped harmonic oscillator.	Applying	1
	OR		
8.	Obtain the expression for energy decay in a damped mechanical harmonic oscillator.	Applying	1

Module II			
1.	Derive Sabien's formula for reverberation time	Applying	2
OR			
2.	Discuss the basic requirements of an acoustically good hall	Applying	2
3.	Explain the various factors affecting architectural acoustics and their remedies	Understanding	2
OR			
4.	Define the term coefficient of absorption and write short notes on it	Remembering	2
U	Explain the production of ultrasonic waves using piezoelectric effect	Understanding	2
OR			
6.	Describe the production of ultrasonic waves by magnetostriction method	Understanding	2
7.	Describe different methods of detecting ultrasonic waves	Understanding	2
OR			
8.	Mention the properties of ultrasonic waves	Remembering	2
Module III			
1.	With the help of suitable diagrams, explain the principle, construction and working of a Ruby laser	Understanding	3
OR			
2.	Explain the construction and working of a He-Ne laser with the help of an energy level diagram.	Understanding	3
3.	Deduce the relation between spontaneous and stimulated emission probabilities A and B. Explain in what situation the value of A/B may be small enough for laser action.	Applying	3
OR			
4.	With the help of suitable diagrams, explain the principle, construction and working of a Semiconductor Laser	Understanding	3
5	Mention applications of Lasers in any field	Remembering	3
OR			
6	Explain with a neat diagram i)absorption ii) spontaneous emission iii) stimulated emission	Understanding	3

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
B.TECH I YEAR I Sem (MR20-2020-21)
Mid Examination I
Objective Question Bank

Subject Name: Engineering Physics **Branch: ME/CE/Min. E**
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1. The vibrating systems are said to be in resonance if [ ]
   a. Their amplitudes are equal b. Their temperatures are same
   c .Their frequencies are equal d. They are in same phase
2. In SHM the force is always directed towards _____ [ ]
   a. Extreme Position b. Equilibrium Position c. both d. None
3. In Simple Harmonic Motion (SHM), the acceleration is [ ]
   a.Directly proportional to the displacement from a central position
   b.Constant
   c.Inversely proportional to the displacement from the central position
   d.Inversely proportional to the square of displacement from the central position
4. The impedance of electrical oscillator is given by = [ ]

a. $\sqrt{R^2-\left[\frac{1}{\omega C}-\omega L\right]^2}$ b. $\sqrt{R^2+\left[\frac{1}{\omega C}-\omega L\right]^2}$ c. $\sqrt{R^2+\left[\frac{1}{\omega C}+\omega L\right]^2}$ d. $\sqrt{R^2-\left[\frac{1}{\omega C}+\omega L\right]^2}$

5. Example for the periodic motion [ ]
   a.Motion of the pendulum in oil b.The motion of the pointer in voltmeter or ammeter
   c.Dead beat motion d.The motion of the Earth around the Sum
6. Time period: [ ]
   a.Time taken for TEN oscillations b.Timeis taken for ONE oscillation
   c.No. of oscillations in one sec. d.None
7. In Simple Harmonic Motion, restoring force is always directed _____ the equilibrium position [ ]
   a.Towards b.Away from c.Above d.Below
8. The maximum displacement from the equilibrium position is called [ ]
   a. Frequency b.Time Period c.Amplitude d.None of the above
9. _____ force is involved in free oscillations [ ]
   a.Resisting b.Restoring c.Pseudo d.None
10. The electrical impedance consists of reactance term ____ [ ]

a. $\left(\frac{1}{\omega C}-\omega L\right)$ b. $\left(\frac{1}{\omega C}+\omega L\right)$ c. $\left(\frac{k}{\omega}\right)$ d. $\left(\frac{\omega}{k}\right)$

11. Restoring force is directly proportional to the ____. [ ]
    a.Frequency b.Amplitude c.Time Period d.Displacement
12. Restoring force and displacement act in the _____ direction. [ ]
    a.Opposite b.Same c.Perpendicular d.None

13. Velocity of a particle executing S.H.M is maximum at [ ]

a.Equilibrium Position b.Extreme Position

c.Intermediate Position d.Cannot be predicted

14. The energy of an oscillator is proportional to _____ of its amplitude. [ ]

a.cube root b.Square root c.Square d.None

15. The frequency (f) of an oscillator executing free oscillations is given by [ ]

a. $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ b. $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$ c. $\frac{1}{\pi}\sqrt{\frac{m}{k}}$ d. $\frac{1}{2}\sqrt{\frac{m}{k}}$

16. The Time period (T) of an oscillator executing free oscillations is given by [ ]

a. $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ b. $2\pi\sqrt{\frac{m}{k}}$ c. $\frac{1}{\pi}\sqrt{\frac{m}{k}}$ d. $\frac{1}{2}\sqrt{\frac{m}{k}}$

17. Potential energy of a particle executing S.H.M is maximum at _____ position. [ ]

a. Equilibrium Position b. Extreme Position

c. Intermediate Position d. Cannot be predicted

18. Kinetic energy of a particle executing S.H.M is maximum at _____ position [ ]

a. Equilibrium Position b. Extreme Position

c. Intermediate Position d. Cannot be predicted

19. The acceleration of a particle executing S.H.M is maximum at _____ position [ ]

a. Equilibrium Position b. Extreme Position

c. Intermediate Position d. Cannot be predicted

20. As the particle executing free oscillations, displaces from the mean position, the total energy is [ ]

a. Increases b. Decreases c.Remains Constant d.None of the above

21. The Energy stored in a capacitor charged to voltage V = [ ]

a. 1/2 LI^2 b.1/2 CV^2 c. 1/2 LV^2 d. None

22. The energy of the particle in simple harmonic oscillator is [ ]

a. $T = \frac{1}{2}\pi n a^2 m$ b. $T = 2ma^2$ c. $T = 2\pi^2 n^2 a^2 m$ d. None

23. The impedance of mechanical oscillator is given by = [ ]

a. $\sqrt{b^2 - \left[\frac{k}{\omega} - \omega m\right]^2}$ b. $\sqrt{b^2 + \left[\frac{k}{\omega} + \omega m\right]^2}$ c. $\sqrt{b^2 + \left[\frac{k}{\omega} - \omega m\right]^2}$ d. None

24. The Energy stored in a Capacitor [ ]

a. Magnetic Energy b. Electrostatic Energy

c. Both Magnetic and Electrostatic Energy d. None

25. The Energy stored in a Inductor [ ]

a. Magnetic Energy b. Electrostatic Energy

c. Both Magnetic and Electrostatic Energy d. None

26. The frequency of the electrical oscillator is given directly by [ ]

a. $n = \frac{1}{2\pi\sqrt{LC}}$ b. $n = \frac{1}{\sqrt{LC}}$ c. $n = \frac{2\pi}{\sqrt{LC}}$ d. None

27. Resisting force is_____ proportional to the velocity [ ]

a. Directly b. Inversely c. Exponential d. None

28. Resisting force and velocity act in the __ direction [ ]

a. Opposite b. Same c. Perpendicular d. None of the above

29. If a particle vibrates under damped oscillations, the amplitude of oscillation is [ ]

a. Remains same b. Increased with time

c.Decreased with time d. None

30. $b^2 < \omega^2$ is the condition for _____ vibrations [ ]

a. Under damped motion b. Over damped

c. Critical damped motion d. None of the above

31. $b^2 > \omega^2$ is the condition for _____ vibrations [ ]

a. Under damped motion b. Over damped motion

c. Critical damped motion d. None of the above

32. $b^2 = \omega^2$ is the condition for _____ vibrations [ ]

a. Under damped motion b. Over damped motion

c. Critical damped motion d. None of the above

33. Mechanical resistance is independent of the _____ of the applied force. [ ]

a. Amplitude b. Frequency c. Phase d. None

34. The mechanical equivalent of charge is [ ]

a. Displacement b. Acceleration c. Velocity d. None of the above

35. A Spring fitted to a door to return it to its closed position after it has been opened, is an example for [ ]

a. Light damping b.heavy damping c. critical damping d. none

36. The mechanical equivalent of current is _____ [ ]

a. Acceleration b. Rate of change of current c. Velocity d. None of these

37. The quality factor of a damped mechanical oscillator is given by [ ]

a. $Q = \frac{\omega_0}{\gamma}$ b. $Q = \frac{1}{\gamma}$ c. $Q = \frac{\gamma}{\omega_0}$ d. none

38. The frequency of the mechanical oscillator is given directly by n = [ ]

a. $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ b. $\frac{1}{2\pi}\sqrt{\frac{m}{k}}$ c. $2\pi\sqrt{\frac{k}{m}}$ d. none

39. The electrical equivalent of mass is _____ [ ]

a. Capacitance b. Resistance c. Inductance d. None of these

40. The electrical equivalent of force constant is_____ [ ]

a. Capacitance b. Reciprocal of capacitance

c. Inductance d. Reciprocal of inductance

41. Electrical impedance in LCR series circuit is the collective opposition offered to flow of current by _____, capacitor and resistor [ ]

a. Diode b. Transistor c. Inductor d. None of these

42. Electrical resistance is independent of the _____of the applied field [ ]

a. Amplitude b. Frequency c. Magnitude d. None of these

43. The Total energy in SHM [ ]

a. increases b. decreases c. Remains constant d. none

44. The Phase different φ between emf and current in an electrical oscillator is given by tanφ = [ ]

a. $\frac{\left[\frac{1}{\omega C}-\omega L\right]}{R}$ b. $\frac{\left[\frac{1}{\omega C}+\omega L\right]}{R}$ c. $\frac{\left[\frac{1}{\omega L}-\omega C\right]}{R}$ d. $\left[\frac{1}{\omega C}-\omega L\right]$

45. The Phase different in mechanical oscillator is given by tanφ = [ ]

a. $\frac{\left[\frac{k}{\omega m}-\omega\right]}{b}$ b. $\frac{\left[\frac{k}{\omega}-\omega m\right]}{b}$ c. $\frac{\left[\frac{k}{\omega}+\omega m\right]}{b}$ d. $\left[\frac{k}{\omega}-\omega m\right]$

46. ____electric field is applied in LCR series resonant circuit. [ ]

a. AC b. DC c. AC &DC d. None of the Above

47. Potential energy of a particle executing S.H.M is minimum at _____ position [ ]

a. Equilibrium position b. Extreme position

c. Intermediate position d. Cannot be predicted

48. The amplitude of a body executing Free oscillations_____ with time [ ]

a. Increases b. Decreases c. Remains constant d. None of the above

49. Velocity of the particle executing S.H.M is zero at _____ position [ ]

a. Equilibrium position b. Extreme position

c. Intermediate position d. Cannot be predicted

50. Total Energy of an electrical harmonic Oscillator given by E= [ ]

a. 1/2 [$LI^2 - CV^2$] b. 1/2 [$CV^2 - LI^2$] c. 1/2 [$LI^2 + CV^2$] d. both a & b

51. Which among the following magnetic materials are usually capable of exhibiting magnetostriction effect? [ ]

a. Dia b. Para c. Ferro d. none of the above

52. Which of the following statements is true? [ ]

a. Ultrasonic waves have the frequency ranging from 20 Hz to 20 KHz

b. Bats can sense the ultrasonic waves

c. Human ear is sensitive to ultrasonic wave

d. Ultrasonic waves are low – frequency waves.

53. Ultrasonic waves are detected by [ ]

a. Telephone b. Quincle's method c. Kundt's method d. Hebbe's method

54. Ultrasonic waves can be sensed by [ ]

a. Human beings b. Dogs c. both (a) and (b) d. none of these

55. The principle used for the production of ultrasonic waves is [ ]

a. photoelectric effect b. Inverse piezoelectric effect

c. Hall effect d. Compton effect

56. In the Kundt's tube method, --- powder is used to detect the ultrasonics [ ]

a. Face powder b. Lycopodium c. Phosphorous d. all of the above

57. In the hexagonal base of the quartz crystal the imaginary lines joining the opposite corners form _____ axes. [ ]

a. X b. Y c. Z d. none of these

58. In ultrasound scanning (sonography) a piezoelectric material is used to [ ]

a. Convert electric energy to mechanical energy

b. Convert mechanical energy to electrical energy

c. Both a and b

d. None of the above

59. The smallest distance between two points on a wave where the particles are in the same state of motion is _____ [ ]

a. Period b. wavelength c. frequency d. hypotenuse

60. The fundamental frequency of a piezoelectric crystal used in ultrasonics is a function of: [ ]

a. Its thickness b. Its density c. both a and b d. None of the above

61. Particle motion in a longitudinal wave is [ ]

a. Parallel to the direction of wave propagation

b. At right angles to the direction of wave propagation

c. Retrograde

d. In counterclockwise ellipses

62. Waves used in ultrasonic testing of materials are _____ in nature. [ ]

a. mechanical b. magnetic c. electromagnetic d. harmonious

63. Ultrasonic methods of testing is used to find [ ]

a. Cracks b.Voids c.Foreign material inclusions d. All above

64. The defects in welded, casted, and forged materials can be detected without spoiling them by _____of materials [ ]

a. Destructive testing b. Magnetostrictive testing

c. Non-destructive testing d. All of the above

65. Which one from the following is a correct characteristic of ultrasonic waves? [ ]

a. Ultrasonics are sound waves of very long wavelength

b. Ultrasonics are sound waves of very high frequency

c. Ultrasonic waves are audible

d. Ultrasonic waves are absorbed by the sea water

66. Ultrasonic waves cannot be produced by [ ]

a. Radio frequency oscillator with diaphragm loudspeaker

b. Radio frequency oscillator with quartz crystal

c. Radio frequency oscillator with nickel rod

d. All of the above

67. The piezoelectric phenomenon is observed in a [ ]

a. Nickel rod b. NaCl crystal c. Quartz crystal d. Iron rod

68. As an ultrasound pulse moves through tissue in a patient's body it will undergo a change in: [ ]

a. Frequency and velocity b. Amplitude c. Intensity d. Both b and c

69. Magnetostriction ultrasonic generators are generally used at [ ]

a. Lower frequencies for higher power outputs

b. Higher frequencies for higher power outputs

c. Lower frequencies for lower power outputs

d. Higher frequencies for lower power outputs

70. A magnetostriction oscillator needs [ ]

a. An oscillator b. A current amplifier

c. A magnetostriction coil d. All of the above

71. Magnetostriction effect is used for producing [ ]

a. Electric field b. Ultrasonic waves

c. Change in temp. of a magnetic material d. None of these

72. _____ Metal is used in Thermal detector method of detecting the ultrasonics. [ ]

a. Gold b. Silver c. Copper d. Platinum

73. An Ultrasonic wave is basically [ ]

a. A magnetic wave b. An electromagnetic wave

c. An inaudible sound d. A heat wave

74. The branch of physics, which deals with the process of generation, propagation and reception of sound in a room or an auditorium, is called [ ]

a. Acoustics b. Fiber Optics c. Statistics d. Ultrasonics

75. The prolongation of sound inside a room or hall even after the source producing the sound is turned off is called [ ]

a. Reverberation b. Aberration c. Reverberation time d. Optics

76. Reverberation time is the time required for the intensity to drop by __ decibel [ ]

a. 60 b. 30 c. 50 d. 100

77 .Ratio of the sound energy absorbed by the surface area to the sound energy absorbed by unit area of an open window is called [ ]

a. Absorption coefficient b. Einstein coefficient

c. Thermal coefficient d. Hall coefficient

78. Reverberation time must be [ ]

a. Optimum b. Minimum c. Maximum d. All the three

79. Absorption coefficient of all substances is measured in terms of [ ]

a. Open Window Unit (OWU) b. Arbitrary unit

c. Both d. None

80. The prevention of the transmission of noise inside or outside the hall is known as [ ]

a. Sound insulation b. Sound proofing c. (a) or (b) d. Bullet proofing

81. Covering the long distant walls and high ceiling with absorbent material is the remedy for [ ]

a. Echo b. Echelon effect c. Resonance d. None of these

82. The reverberation time should be ___for music [ ]

a. 1- 2 second b. 5 second c. 10 second d. All these

83. The reverberation time should be ____ for speech [ ]

a. 0.5 to 1 second b. 1000 second c. 100 second d. 10 second

84. Study of behaviour of sound waves in a closed space is called [ ]

a. Acoustics quieting b. Acoustics of building

c. Both a & b d. reverberation

85. If the hall to be acoustically good, the hall must be [ ]

a. Empty b. Half of the audience

c. Full of audience d. Both A&B

86. There should be no _____ within the building to have a clear sound. [ ]

a. Curtains b. furniture c. resonance d. None of these

87. There should be no _____in auditorium to avoid interference of sound. [ ]

a. Carpet b. Furniture c. Echelon effect d. None of these

88. ____is the time required for the intensity to drop to one millionth (10^{-6}) of its initial value [ ]

a. Reverberation b. Absorption Coefficient

c. Reverberation time d. Loudness

89. Sabine formula ____ [ ]

a. T = 0.0165V/A b. T = 0.165V/A c. T = 0.00165V/A d. T = 1.65V/A

90. There is overlapping of successive sounds if the reverberation time is [ ]

a. Very Small b. Medium c. Large d. None of these

91. If the reverberation time is ____the sound energy cannot reach the end of the auditorium [ ]

a. Large b. 165 Sec c. Small d. None

92. A set of railings or any regular spacing of reflecting surfaces may produce a musical note due to the regular succession of echoes of the original sound is called [ ]

a. Noise b. Loudness c. Echelon effect d. None of the above

93. To have good sound effect inside a hall [ ]

a. The reverberation time has to be as large as possible

b. The reverberation time has to be zero

c. The hall should not have any sound absorbing material

d. The reverberation time has to be optimum

94. The walls of a halls built for music concerns should [ ]

a. Amplify sound b. Reflect sound

c. Transmit sound d. Absorb sound

95. Which one of the following has minimum absorption coefficient [ ]

a. Glass b. Felt c. Open window d. Wooden Floor

96. The reverberation time is [ ]

a. Proportional to volume b. Proportional to area

c. Inversely Proportional to Volume d. None

97. The reverberation time can be controlled [ ]

a. Decorating the walls by picture & maps

b. Using heavy curtains with folds

c. Covering the floor with carpets

d. All the above

98. To absorb the sound in a hall which of the following are used [ ]

a. Glasses, stores b. Carpets, curtains

c. Polished surfaces d. None

99. Sound waves with frequencies above 20 kHz are called [ ]

a. Ultrasonics b. Supersonics c. Audible d. None

100. Wavelength of ultrasonic waves is [ ]

a. More than audible sound b. Less than audible sound

c. Equal to audible sound d. none

101. Coherence in lasers is due to [ ]

a. Spontaneous emission b. Stimulated emission

c. Population inversion d. non thermal equilibrium

102. Population inversion means that [ ]

a. Maintaining more number of atoms in higher energy levels

b. Maintaining more number of atoms in the ground level

c. Maintaining more number of atoms in the meta stable state than the ground state.

d. Maintaining more number of atoms in the laser transition levels.

103. Emission of photon when electron jumps from higher energy to lower energy state due to interaction with another photon is called [ ]

a. Spontaneous emission b. Stimulated emission

c. Induced emission d. Amplified emission

104. The energy level in which life time of the particle is more is known as [ ]

a. Excited state b. Metastable state c. Both d. none

105. Among the following lasers, which laser is widely used in Ophthalmology? [ ]

a. Ruby laser b. Argon ion laser c. Nd YAG laser d. CO_2 laser

106. In He-Ne Laser, the ratio of of He-Ne is in the order [ ]

a. 1:10 b. 1:1 c. 10:1 d. 100:1

107. The colour of the laser output from Ruby laser is [ ]

a. Green b. Blue c. Red d. Yellow

108. Measurement of variation of divergence of laser beam with distance is used to determine [ ]

a. Coherence b. Coherence c. Directionality d. Brightness

109. Coherence of light is measured from [ ]

a. Variation in spot size with distance b. visibility of interference fringes it produces

c. Brightness of the beam d. wavelength of the beam

110. Example for creation of population inversion by optical pumping is [ ]

a. He – Ne laser b. Diode laser c. Ruby laser d. CO_2 laser

111. The wavelength of emission from He-Ne laser is [ ]
a. 6328Å b. 6943Å c. 3371Å d. 1024Å

112. In the following which energy is suitable for pumping [ ]
a. Electrical b. Optical c. Chemical d. All the above

113. Laser radiation is [ ]
a. Monochromatic b. highly directional c.coherent, stimulated d. All the above

114. Population inversion cannot be achieved by [ ]
a. Chemical reaction b. thermal process c. electric discharge d. optical pumping

115. He-Ne gas laser is [ ]
a. Pulsed b. Continuous c. Semiconductor laser d. None

116. In ruby lasing material the percentage of Cr3+ ions in Al2O3 is [ ]
a. 0.05 b. 0.5 c. 5 d. 0.005

117. In meta stable state, the life time of atoms is of the order [ ]
a. 10-8 sec b. 10 sec c. 10-3 sec d. 10-14 sec

118. In He-Ne laser _____ atoms involved in laser emission are [ ]
a. Ne atoms b. He atoms c. Both d. None

119. The source of excitation in He-Ne gas laser is [ ]
a. Xenon flash lamp b. Optical Pumping
c. Direction conversion d. Electrical discharge

120. Ruby laser emits light of wavelength [ ]
a. 6943Å b. 6328Å c. 8628 Å d. 8370 Å

121. Ruby laser is example for _____ level scheme [ ]
a. 4 b. 3 c. 5 d. None

122. According to Boltzmann distribution law [ ]
a. $N_i = g_i N_0 \exp(E_i/KT)$ b. $N_i = g_i N_0 \exp(-E_i/KT)$
c. $N_i = (N_0/g_i)\exp(E_i/KT)$ d. $N_i = (N_0/g_i)\exp(-E_i/KT)$

123. Laser beam does not have the property of [ ]
a. Monochromacity b. Coherence c. Divergence d. Directionality

124. Laser output beam of Ruby Laser is [ ]
a. Continuous b. Pulsed c. Both d. None

125. Which of the following are required for producing LASER? [ ]
a. Excitation source b. Active medium c. LASER cavity d. All the above

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