TEACHERS RECRUITMENT BOARD, CHENNAI – 6

WRITTEN COMPETITIVE EXAMINATION FOR

POST GRADUATE ASSISTANTS (2006-2007) – H-04 – A Series

Time Allowed : 3 Hours] **PHYSICS** **[Maximum Marks : 150**

1. In Indian history, who is known as the 'Indian Napoleon'?
A) Asoka B) Chandragupta II
C) Chanakya D) Samudragupta

2. Who of the following is associated with the theory of "Laissez-faire" in Economics?
A) Malthus B) Marshall
C) Adam Smith D) Keynes

3. The boundary line between India and China is known as
A) Radcliffe line B) Durand line
C) McMahon line D) Maginot line

4. Which of the following countries is called the "Land of White Elephants"?
A) Malaysia B) Thailand
C) Canada D) Ethiopia

5. Who was the founder of Brahmo Samaj?
A) Raja Rammohan Roy B) Rabindranath Tagore
C) Keshab Chandra Sen D) M. G. Ranade

6. Malaria is caused by
A) Plasmodium B) Virus
C) DNA D) Bacterium

7. Article 14 of the Constitution of India deals with
A) Equality before law
B) Abolition of untouchability
C) Freedom of speech
D) Freedom of religion

8. Dynamo is a device for converting
A) electricity to mechanical energy
B) mechanical energy to electrical energy
C) magnetism to electricity
D) electricity to magnetism

9. Which of the following dynasties was not in power during the Sangam age?
A) Pandyas B) Cheras
C) Cholas D) Pallavas

10. Which country did Italy beat in the finals of the FIFA World Cup 2006?
A) Germany B) France
C) Portugal D) Spain

11. A useful teaching-learning method for slow learners is
A) Lecture B) Self-learning
C) Memorising D) Group learning

12. There is a story about a fox, who unable to reach some grapes, proclaimed that they were sour. This is a kind of
A) intellectualization B) rationalization
C) negativism D) egocentrism

13. Attempts to train defectives and delinquents, so as to make them, as far as possible, useful and efficient members of the community is called
A) Remedial instruction B) Programmed instruction
C) Physical instruction D) Religious instruction

14. In an intelligence test a ten year old boy is found to have a mental age of 11. This I.Q. is calculated as
A) 100 B) 120 C) 110 D) 90

15. DIET stands for
A) District Institute for Employment of Teachers
B) District Institute of Education and Training
C) District Institute of Elementary Teacher Education
D) District Institute of Educational Technology

16. Self actualisation is defined as "the full development of personal potential" by
A) Rotter B) Maslow
C) McCleland D) Hull

17. Educationist Froebel is
A) an idealist B) a naturalist
C) a realist D) a pragmatist

18. School started by Madam Montessori was known as
A) Children's House B) Boys' School
C) Summer Hill School D) Girls' School

19. MLL represents
A) Marginal Level of Learning
B) Maximum Level of Learning
C) Motor Learning Level
D) Minimum Level of Learning

20. The name of the educational policy of Gandhiji is
A) Social Education B) Basic Education
C) Technical Education D) Rural Education

21. A period showing no progress in a learning curve is termed as
A) error B) inhibition
C) plateau D) terminal point

22. Group factor theory of intelligence was proposed by
A) Spearman B) Thorndike
C) Thurstone D) Guilford

23. I.Q. can be calculated using the formula
A) $\frac{\text{Mental Age}}{\text{Chronological Age}} \times 100$ B) $\frac{\text{Chronological Age}}{\text{Mental Age}} \times 100$
C) $\frac{\text{Mental Age}}{\text{Chronological Age}}$ D) $\frac{\text{Chronological Age}}{\text{Mental Age}}$

24. Which type of thinking is very essential for creativity?
A) Positive thinking B) Convergent thinking
C) Practical thinking D) Divergent thinking

25. Robert Gagne's theory of hierarchical learning consists of
A) 7 types of learning B) 2 types of learning
C) 8 types of learning D) 10 types of learning

26. Which Article of the Constitution of India advocates free and compulsory school education?
A) Article 354 B) Article 45
C) Article 30 D) Article 31

27. The most effective way of character formation in students is to
A) advise the students frequently
B) narrate about the lives of great men and women
C) organise religious functions in the school
D) make them sing songs

28. A loud explosion is heard as you are teaching the class. What would you do?
A) Stay in the class and send the class leader to find the details
B) Walk out of the class to know details
C) Run to neighbouring class for information
D) Advise the students to get away from the class in an orderly manner

29. The agency which helps to improve the quality of school education at state level is
A) NCERT B) NCTE C) SCERT D) DTE

30. Education leads to the modification of
A) Attitude B) Behaviour
C) Life D) Interest

31. Value Education means
A) Religious Education B) Moral Education
C) Cost Education D) Economics of Education

32. Punishment is
A) Reinforcement B) Negative Reinforcement
C) Positive Reinforcement D) Encouragement

33. Growth and development of the child are determined by two factors
A) heredity and school B) school and home
C) home and society D) heredity and environment

34. Learning in free atmosphere was advocated by
A) Montessori B) Gagne
C) J. Krishnamurthy D) Gandhiji

35. Thematic Apperception Test (TAT) is conducted to test the
A) intelligence of a person B) personality of a person
C) memory of a person D) achievement of a person

36. 'There is a tendency for all of us to seek our faults in others' is termed as
A) introjection B) repression
C) projection D) rationalisation

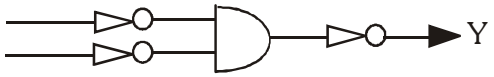
37. What is the principle behind individualised instruction?
A) Reinforcement and learning
B) Accommodation
C) Adaptation
D) Schemes

38. Who advocated the method of 'Learning by doing'?
A) A.S.. Neil B) John Dewey
C) Bertrand Russell D) Kilpatrick

39. Which of the following plays the major role in social development of a child?
A) School B) Family
C) Society D) Neighbours

40. An objective factor which determines attention in the classroom is
A) interest B) novelty
C) sentiment D) attitude

41. The implementation of the following logic circuit performs ..... logic



A) AND B) OR
C) NAND D) NOR

42. How many flip-flops are required to store a decimal number 100 in binary register?
A) 3 B) 4
C) 6 D) 8

43. How many binary bits are added at a time in a full adder?
A) 2 B) 3
C) 4 D) 6

44. What is the attenuation produced by the feedback network in a phase shift oscillator?
A) 3 B) 8
C) 17 D) 29

45. The feedback component in an Op-Amp integrator circuit is
A) an inductor B) a resistor
C) a capacitor D) a transistor

46. In a practical sample and hold circuit the control gate is
A) AND gate B) NAND gate
C) a FET D) a MOSFET

47. Which of the following multivibrators has the inherent characteristic of dividing the input frequency by two?
A) monostable B) bistable
C) astable D) tristable

48. The cavity magnetron uses strapping to
A) prevent mode jumping
B) prevent cathode back-heating
C) ensure bunching
D) improve the phase-focusing effect

49. In 8085 microprocessor the ..... register pair serves as a 16 bit accumulator
A) WZ B) BC
C) DE D) HL

50. On execution of the instruction MVIA, 00H which of the following flags will be affected?
A) Z flag B) CY flag
C) AC flag D) No flag

51. The main features of liquid drop model and shell model are combined and proposed as
A) optical model B) collective model
C) Nelson model D) none of these

52. Which one of the following has a continuous spectrum?
A) X-ray B) α-ray
C) β-ray D) λ-ray

53. GM counter should always be worked in ..... as indicated by its characteristic curve
A) ohmic region B) plateau region
C) breakdown region D) none of these

54. The purpose of moderator in a nuclear reactor is to
A) increase the reaction
B) cool the reactor
C) to slow down the fast neutrons
D) to absorb the neutron

55. If the multiplication factor K>1, the reaction is called
A) critical B) super-critical
C) sub-critical D) none of these

56. The particle, which most easily penetrates through the nucleus of an atom, is
A) neutron B) electron
C) proton D) β-particles

57. The sun releases energy by
A) nuclear fission
B) nuclear fusion
C) spontaneous combustion
D) hydrothermal process

58. The scintillation counter
A) is not used for counting α- particles
B) counts only β- rays
C) uses a material, which emits light when a charged particle strikes it
D) counts only γ- particles

59. Fast neutrons are slowed down by
A) diffraction through a slit
B) using shield of lead
C) passing them through a substance rich in hydrogen
D) sheet of iron

60. Which of the following flip-flops has overcome the race around problem?
A) RS B) RST C) JK D) $\frac{M}{S}$

61. Partial wave analysis can be applied when the potential is
A) zero B) spherically symmetric
C) negative D) none of these

62. In perturbation theory Fermi's golden rule gives
A) reflection coefficient
B) total energy
C) $\frac{\text{transition probability}}{\text{unit time}}$
D) transmission coefficient

63. Born approximation can be applied for
A) low energy particles
B) high energy particles
C) negative energy particles
D) all the particles

64. In case of a potential step of height V_0, for a particle of energy $E<V_0$, the transmittance is
A) zero B) finite non-zero
C) infinite D) 1

65. The degree of degeneracy for 3D isotropic harmonic oscillator is
A) n^3 B) $2n^2+1$
C) $\frac{1}{2}(2n+1)(2n+2)$ D) $\frac{1}{2}(n+1)(n+2)$

66. The energy of a particle in a box is given by
A) $\frac{n\hbar^2\pi^2}{2mL}$ B) $\frac{n^2\pi^2\hbar^2}{2mL^2}$ C) $\frac{\pi^2\hbar^2}{2mL}$ D) $\frac{n\hbar}{2\pi}$

67. The minimum value of angular momentum obtained by coupling three angular momenta 1, $\frac{3}{2}$ & $\frac{5}{2}$ is
A) 1 B) $\frac{1}{2}$ C) 0 D) $\frac{3}{2}$

68. Which of the following is an Eigen function of L_z?
A) $\cos\phi$ B) $\sin^2\phi$
C) $e^{i\phi}$ D) $\cos^2\phi$

69. The minimum energy required to disrupt a stable nucleus is
A) binding energy B) zero point energy
C) potential energy D) none of these

70. The electrostatic repulsion between protons tends to ..... the binding energy
A) decrease B) increase
C) not alter D) make zero

71. The volume of the parallelopiped whose edges are represented by $\vec{a} = 2\hat{i} - 3\hat{j} + 2\hat{k}, \vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 3\hat{k}$ is,
A) 5 B) 10 C) 15 D) 20

72. A vector field expressible as the negative gradient of a scalar field is called
A) non-conservative field
B) conservative field
C) lamellar field
D) non-lamellar field

73. Stokes' theorem relates to
A) volume integral and line integral
B) surface integral and line integral
C) a differential and volume integral
D) surface integral and volume integral

74. In the spherical co-ordinate (r,θ,ϕ) system the scale factors (h_1, h_2, h_3) are given by
A) $(r, r\sin\theta, r\cos\phi)$ B) $(r, r\cos\theta, r\sin\phi)$
C) $(1, r\sin\theta, r\sin\phi)$ D) $(1, r, r\sin\theta)$

75. The rank of the diagonal matrix

$$\begin{bmatrix} 1 & & & & \\ & 0 & & & \\ & & 2 & & \\ & & & -5 & \\ & & & & 0 \end{bmatrix}$$ **is**

A) 1 B) 2 C) 3 D) 4

76. Divergence of a vector $\vec{A} = A_1\hat{e}_1 + A_2\hat{e}_2 + A_3\hat{e}_3$ in orthogonal curvilinear co-ordinates is given by

A) $\frac{1}{h_1h_2h_3}\left[\frac{\partial}{\partial u_1}(A_1h_2h_3) + \frac{\partial}{\partial u_2}(A_2h_3h_1) + \frac{\partial}{\partial u_3}(A_3h_1h_2)\right]$

B) $h_1h_2h_3\left[\frac{\partial}{\partial u_1}(A_1h_2h_3) + \frac{\partial}{\partial u_2}(A_2h_3h_1) + \frac{\partial}{\partial u_3}(A_3h_1h_2)\right]$

C) $\frac{1}{h_1h_2h_3}\left[\frac{\partial}{\partial u_1}(A_3h_1h_2) + \frac{\partial}{\partial u_2}(A_1h_2h_3) + \frac{\partial}{\partial u_3}(A_2h_3h_1)\right]$

D) $h_1h_2h_3\left[\frac{\partial}{\partial u_1}(A_3h_1h_2) + \frac{\partial}{\partial u_2}(A_1h_2h_3) + \frac{\partial}{\partial u_3}(A_2h_3h_1)\right]$

77. Which one of the following is true for a Hermitian matrix (A)?
A) Diagonal elements are pure imaginary
B) $A^{\dagger} = A$
C) Eigen values are real
D) $A^{-1} = A$

78. Eigen values of the matrix $\begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$ are
A) 1,3 B) 2,4 C) 1,4 D) 2,3

79. If the vectors $\vec{A}$ and $\vec{B}$ are irrotational, then
A) $\vec{A}\times\vec{B}$ is also irrotational
B) $\vec{A}.\vec{B}$ is irrotational
C) $\vec{A}\times\vec{B}$ is solenoidal
D) $\vec{A}.\vec{B}$ is solenoidal

80. Of the following Bessel's differential equation is
A) $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + n(n+1)\,y = 0$
B) $x^3\frac{d^2y}{dx^2} + x^2\frac{dy}{dx} + (x^2-n^2)\,y = 0$
C) $\frac{d^2y}{dx^2} + (1-x^2)\frac{dy}{dx} + n^2y = 0$
D) $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2-n^2)\,y = 0$

81. The first law of thermodynamics is the conservation of
A) momentum B) energy
C) mass D) both (A) and (B)

82. The change in entropy is
A) positive in a reversible change
B) negative in an irreversible change
C) positive in an irreversible change
D) negative in a reversible change

83. When a superconductor is cooled in a magnetic field at the transition temperature T_c lines of induction B are pushed out. This phenomenon is called
A) Zeeman effect B) Paschen-Back effect
C) Peltier effect D) Meissner effect

84. The London equation for the super-conductor is given by
A) $J_S = -\left(\frac{n_z e^2}{m}\right)\vec{E}$ B) $J_S = -\left(\frac{n_z e}{m}\right)\vec{E}$
C) $J_S = \left(\frac{n_z e^2}{m}\right)\vec{H}$ D) $J_S = \left(\frac{n_z e}{m}\right)\vec{H}$

where the symbols have their usual meaning

85. Ice (H_2O) is an example for
A) triclinic system B) hexagonal system
C) monoclinic system D) orthorhombic system

86. Type I superconductors have properties, which are characteristics of a pure elemental superconductor i.e.
A) a fair low value of H_C
B) a very high value of H_C
C) broad transition of zero resistivity
D) very narrow transition of zero resistivity

87. The combined form of first and second laws of thermodynamics is given by
A) $TdS = dU + PdV$ B) $dQ = TdS + PdV$
C) $dU = TdS + dQ$ D) $TdS = dU - PdV$

88. $[x, p_x] = [y, p_y] = [z, p_z] =$
A) $i\hbar$ B) xyz
C) $p_x p_y p_z$ D) 0

89. In a linear harmonic oscillator, the zero point energy is
A) $\frac{1}{2}\hbar\omega_C$ B) $\frac{5}{2}\hbar\omega_C$
C) $5\hbar\omega_C$ D) $2\hbar\omega_C$

90. Which of the following is true?
A) $[L_x, L_y] = i\hbar L_z$ B) $[L_x, L_y] = \hbar L_z$
C) $[L_x, L_y] = \hbar L_x$ D) $[L_x, L_y] = 0$

91. At ordinary temperature the molecules
A) remain in their highest vibrational level
B) remain in their lowest vibrational level
C) remain in any vibrational level
D) does not show any type of vibration

92. The allowed rotational energy in a diatomic molecule is $E_r = BJ(J+1)$ where B is given by
A) $B = \frac{h}{8\pi^2 IC}$ B) $B = \frac{h^2}{4\pi IC}$
C) $B = \frac{h^2}{4\pi^2 I^2 C}$ D) $B = \frac{h}{8\pi^2 I^2 C}$

93. If several molecules have same energy then they are said to be
A) in ground state B) in higher energy level
C) in degenerate state D) in metastable state

94. The symmetric stretching mode of vibration of CO_2 is
A) Raman active B) Raman inactive
C) IR active D) active in visible region

95. In the experimental set-up of Raman effect, the signal is measured by
A) lens
B) sensitive photo-multiplier
C) filter
D) spectrometer

96. Electronic spectra arise due to the changes in the arrangement of
A) neutrons B) protons
C) molecular electrons D) protons and neutrons

97. A conductor, which exhibits zero resistivity or infinite conductivity at critical temperature, is called a
A) dielectric material B) super-conductor
C) semi-conductor D) diamagnetic material

98. Value of atomic radius of a face centered cubic structure is
A) $\frac{a}{2}$ B) $\frac{\sqrt{3a}}{4}$ C) $\frac{\sqrt{2a}}{4}$ D) $\frac{\sqrt{3\pi}}{8}$

99. The first Brillouin zone is the Wigner Seitz primitive cell of the
A) crystal lattice B) reciprocal lattice
C) lattice planes D) Bravais lattice

100. According to Debye's T^3 law the specific heat C_v at high temperature is
A) approximately equal to 3R
B) approximately equal to T^3
C) approximately equal to T^2
D) approximately equal to T

101. At an interface separating two dielectric media
A) tangential component of $\vec{E}$ and normal component of $\vec{B}$ are continuous
B) tangential components of $\vec{D}$ and $\vec{H}$ are continuous
C) normal components of $\vec{D}$ and $\vec{H}$ are continuous
D) normal component of $\vec{D}$ and tangential component of $\vec{H}$ are continuous

102. When electromagnetic field (with varying frequency) is applied to a polar molecular system, the dielectric constant of the system
A) remains unchanged
B) increases with increase in frequency
C) varies anomalously
D) decreases with increase in frequency

103. Mass of an object in motion appears to be double its rest mass. The speed of the object is ..... time the velocity of light
A) $\frac{1}{2}$ B) $\frac{1}{\sqrt{3}}$ C) $\frac{1}{4}$ D) $\frac{\sqrt{3}}{2}$

104. If a particle and its anti-particle get annihilated with the release of energy E, the mass of each particle should be
A) $\frac{E}{2c^2}$ B) $\frac{E}{c^2}$ C) $\frac{2E}{c^2}$ D) $\frac{E}{2c}$

105. According to Einstein's special theory of relativity
A) space is absolute, but time is relative
B) space and time are both relative
C) space is relative, but time is absolute
D) space and time are both absolute

106. Pure rotational spectrum of a diatomic molecule consists of
A) two equally spaced lines
B) no regular pattern
C) three equally spaced lines
D) many equally spaced lines

107. The selection rule for vibrational transitions obtained in vibrational-rotational spectra is given by
A) $\nabla\nu = \pm 1$ B) $\nabla J = \pm 2$ C) $\nabla J = \pm 1$ D) $\nabla\nu = 0$

108. The probability of transition between the given vibrational levels of two electronic states A & B is determined by
A) Pauli's exclusion principle
B) Frank-Condon principle
C) Hund's Rule
D) Mutual exclusion principle

109. The doublets observed in alkali spectra are due to
A) screening of the k-electrons
B) spin orbit interaction of the electrons
C) pressure of the isotopes
D) spin-spin interaction

110. In Raman rotation-vibration spectra Q branch is
A) present
B) absent
C) present as it is in the IR spectra
D) present as it is in the UV region

111. Maxwell-Boltzmann distribution can be applied to a system of
A) indistinguishable particles
B) distinguishable particles
C) interacting electrical particles
D) interacting neutral particles

112. The density of state in the phase space can be shown to be equal to
A) h^3 B) $\frac{1}{h^3}$ C) h^2 D) h

113. There is a no triple point for
A) Helium B) Hydrogen
C) Nitrogen D) Argon

114. Fountain effect is shown by
A) Liquid He II B) Liquid He I
C) Hydrogen D) Oxygen

115. The electric field $\vec{E}$ at the centre of a uniformly charged spherical conductor of radius R in vacuum is
A) $\frac{qr}{4\pi\varepsilon_0 R^3}$ B) $\frac{q}{4\pi\varepsilon_0 r^2}$ C) $\frac{q}{4\pi\varepsilon_0 R^2}$ D) zero

116. Differential form of Gauss's law in MKS system is
A) $\nabla.\vec{E} = 4\pi\rho$ B) $\nabla.\vec{E} = \frac{\rho}{4\pi\varepsilon_0}$
C) $\nabla.\vec{E} = \frac{\rho}{\varepsilon_0}$ D) $\nabla.\vec{E} = \rho$

117. Electric displacement current arises due to
A) positive charges only
B) both positive and negative charges
C) negative charges only
D) time varying electric field

118. Magnetic vector potential due to magnetic dipole is proportional to
A) r^{-1} B) r^{-2} C) r^{-3} D) r

119. The law of conservation of energy in electromagnetism is
A) Gauss's theorem B) Poynting's theorem
C) Continuity equation D) Brewster's law

120. The electric field $\vec{E}$ in terms of the electromagnetic potentials is given by
A) $\nabla\times\vec{A}$ B) $-\nabla\phi-\nabla\times\vec{A}$
C) $-\nabla\phi-\frac{\partial\vec{A}}{\partial t}$ D) $-\nabla\phi+\frac{\partial\vec{A}}{\partial t}$

where the symbols have their usual meaning.

121. If $\vec{F}_i$ is the actual force and $\vec{p}_i$ the reversed effective force then D' Alembert's principle is given by
A) $\sum_i\left(\vec{F}_i-\dot{\vec{P}}_i\right).\delta r_i = 0$ B) $\sum_i\left(\dot{\vec{P}}_i-\vec{F}_i\right).\delta r_i = 0$
C) $\Delta\int_{t_1}^{t_2}\sum_i p_i\dot{q}_i dt = 0$ D) $\int_{t_1}^{t_2}\sum_j p_j q_j dt = 0$

122. Generation of body set of axes from space set of axes through three successive rotations gives
A) Lorentz transformations
B) Euler angles
C) a non-orthogonal transformation
D) none of these

123. Hamilton's principle is stated as
A) $\delta I = \delta\int_{t_1}^{t_2}(H+\Delta H)dt = 0$
B) $\delta I = \delta\int_{t_1}^{t_2}(L+\Delta L)dt = 0$
C) $\delta I = \delta\int_{t_1}^{t_2}L dt = 0$
D) $\delta I = \delta\int_{t_1}^{t_2}(H-\Delta H)dt = 0$

124. It can be shown that
A) $v_{r.m.s.} = \sqrt{\frac{3KT}{M}}$ B) $V_{r.m.s.} = \sqrt{\frac{2KT}{M}}$
C) $V_{r.m.s.} = \sqrt{\frac{KT}{M}}$ D) $V_{r.m.s.} = \sqrt{\frac{M}{3KT}}$
where the symbols have their usual meaning

125. Pauli's exclusion principle is obeyed by
A) particles with zero spin
B) bosons
C) fermions
D) particles with either integral spin or half integral spin

126. According to Maxwell's law of equi-partition of energy, the energy associated with each degree of freedom is

A) $\frac{1}{2}$ KT B) 5 KT C) 2 KT D) $\frac{2}{5}$ KT

127. Fermi-Dirac statistics are applied for particles with

A) zero spin B) integral spin
C) zero and integral spin D) half integral spin

128. Liquid He has

A) high viscosity B) zero viscosity
C) low viscosity D) very high viscosity

129. Phase-space is

A) 1-dimensional B) 3-dimensional
C) 4-dimensional D) 6-dimensional

130. The relation between entropy(s) and probability (w) is

A) $s=k \ln w$ B) $s=\frac{k}{w}$
C) $s=w$ D) $s=k-w$

131. Representation of groups that may be expressed in terms of representation of lower dimensionality is

A) irreducible
B) reducible
C) unitary
D) character representation

132. Special unitary group SU(n) is the group of all n×n unitary matrices with determinant

A) +1 B) ± 1 C) –1 D) ± n

133. From Newton's second law of motion in the equation $\frac{d\vec{P}}{dt}=\vec{F}$, linear momentum is conserved if

A) the total force is zero
B) the total force is non-zero
C) the angular momentum changes
D) the angular momentum does not change

134. The number of independent ways in which a mechanical system can move without violating any constraint, which may be imposed, is called

A) the number of degrees of freedom of the system
B) a holonomic constraint
C) a scleronomic constraint
D) a non-holonomic constraint

135. In the description of an object rolling on a rough surface without slipping, the description of its motion involves

A) a holonomic constraint
B) a rheonomic constraint
C) a non-holonomic constraint
D) a scleronomic constraint

136. Lagrange's equation of motion is

A) a second order differential equation
B) dependent on the co-ordinates used
C) independent of time
D) a first order differential equation

137. Lagrange's equation of motion for one dimension L.H.O. can be written as

A) $\frac{d}{dt}\left(\frac{\partial L}{\partial x}\right)-\left(\frac{\partial L}{\partial x}\right)=0$ B) $\frac{d}{dx}\left(\frac{\partial L}{\partial x}\right)-\left(\frac{\partial L}{\partial x}\right)=0$

C) $\frac{d}{dt}\left(\frac{\partial L}{\partial x}\right)=0$ D) $\left(\frac{\partial L}{\partial x}\right)-\left(\frac{\partial L}{\partial x}\right)=0$

138. Hamilton's canonical equations of motion are represented by

A) $\dot{q}_i=\frac{\partial H}{\partial P_j},\dot{p}_j=-\frac{\partial H}{\partial q_j}$ B) $\dot{q}_i=-\frac{\partial H}{\partial P_j},\dot{p}_j=-\frac{\partial H}{\partial q_j}$

C) $\dot{q}_i=\frac{\partial H}{\partial P_j},\dot{p}_j=\frac{\partial H}{\partial q_j}$ D) $\dot{q}_i=-\frac{\partial H}{\partial P_j},\dot{p}_j=\frac{\partial H}{\partial q_j}$

139. The principle of least action for conservative system is expressed as

A) $\int_{t_1}^{t_2}\sum_j p_j\dot{q}_j\,dt=0$ B) $\Delta\int_{t_1}^{t_2}\sum_j p_j\dot{q}_j dt=0$

C) $\Delta\int_{t_1}^{t_2}\sum_j \dot{p}_j dt=0$ D) $\Delta\int_{t_1}^{t_2}\sum_j \dot{q}_j dt=0$

140. $L=I\vec{\omega}$ implies that L is the angular momentum, $\vec{\omega}$ the angular velocity vector and I represents

A) tensor of rank 3
B) a vector
C) the moment of inertia tensor
D) none of these

141. Legendre's polynomial is given by $P_n(x)=\frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$. When n=2 the polynomial is given by

A) $3x^2-1$ B) $\frac{1}{2}(3x^2-1)$

C) $3x-1$ D) $\frac{1}{4}(3x-1)$

142. The Gamma function Γn is given by $\Gamma n=\int_0^\infty e^{-x}x^{n-1}dx$. It is known that $\Gamma(n+1)=n\Gamma n$. Then $\Gamma(n+1)$ is also given by

A) n! B) (n+1)! C) (n–1)! D) $\frac{n!}{(n+1)!}$

143. The probability of throwing 10 with two dice is

A) $\frac{1}{9}$ B) $\frac{1}{6}$ C) $\frac{1}{24}$ D) $\frac{1}{12}$

144.If the probabilities of some events are P_1, P_2, P_3, ... P_n then the probability that at least one of the events will occur is

A) $1-P_1-P_2-P_3.....-P_n$

B) $(1-P_1)(1-P_2)(1-P_3)..... (1-P_n)$

C) $1-(1-P_1)(1-P_2)(1-P_3)..... (1-P_n)$

D) $P_1+P_2+P_3+ .....+P_n$

145.A bag contains 9 bolts, of which 2 are defective. Two bolts are drawn without replacement. The probability that both of them are not defective is

A) $\frac{7}{12}$ B) $\frac{14}{27}$ C) $\frac{1}{36}$ D) $\frac{7}{36}$

146.The binomial distribution whose mean is 5 and variance is $\frac{10}{3}$ is

A) ${}^{10}C_r\left(\frac{2}{3}\right)^r\left(\frac{1}{3}\right)^{15-r}$ B) ${}^{15}C_r\left(\frac{1}{2}\right)^r\left(\frac{1}{2}\right)^{15-r}$

C) ${}^{15}C_r\left(\frac{1}{3}\right)^r\left(\frac{2}{3}\right)^{15-r}$ D) ${}^{10}C_r\left(\frac{1}{2}\right)^r\left(\frac{2}{3}\right)^{15-r}$

147.In Poisson distribution the probability is given by $P(r) = \frac{m^r e^{-m}}{r!}$. If $8P(0) = P(2)$, then the standard deviation is

A) 16 B) 4 C) 2 D) $\sqrt{2}$

148.If x_1, x_2, ... x_n are the errors in n measurements of a parameter, then according to the principle of least squares.

A) $x_1^2.x_2^2.x_3^2.....x_n^2$ = minimum

B) $x_1^2.x_2^2.x_3^2.....+ x_n^2$ = minimum

C) $x_1^2.x_2^2.x_3^2.....x_n^2$ = maximum

D) $(x_n-x_1)^2+(x_n-x_2)^2+.....+(x_n-x_{n-1})^2$=minimum

149.Errors occuring due to lack of care on the part of observer is termed as

A) random error B) systematic error

C) probable error D) gross error

150.A set of elements of a group which itself forms a group is called a

A) sub-group B) finite group

C) Abelian group D) cyclic group

TRB PG ASSISTANTS 2006-07 – PHYSICS – ANSWERS

1 ..... D	2 C	3 C	4 ..... B	5 ..... A	6 ..... A	7 ..... A	8 ..... B	9 ..... D	10 ..... B
11 ..... D	12 ..... A	13 ..... A	14 C	15 ..... B	16 ..... B	17 ..... B	18 ..... A	19 ..... D	20 ..... B
21 C	22 C	23 ..... A	24 ..... D	25 C	26 ..... B	27 ..... B	28 ..... B	29 ..... A	30 ..... B
31 ..... B	32 ..... B	33 ..... D	34 C	35 ..... B	36 C	37 ..... A	38 ..... B	39 C	40 ..... A
41 C	42 ..... A	43 ..... B	44 ..... *	45 ..... B	46 ..... D	47 ..... B	48 ..... B	49 ..... A	50 C
51 ..... B	52 ..... A	53 ..... B	54 C	55 ..... B	56 ..... A	57 ..... B	58 ..... B	59 ..... A	60 C
61 ..... A	62 C	63 ..... B	64 ..... A	65 ..... A	66 ..... B	67 ..... D	68 ..... B	69 ..... A	70 ..... B
71 C	72 ..... B	73 ..... B	74 ..... B	75 C	76 C	77 ..... D	78 ..... B	79 ..... A	80 C
81 ..... B	82 ..... B	83 ..... D	84 ..... A	85 C	86 ..... A	87 ..... A	88 ..... A	89 ..... A	90 ..... D
91 ..... D	92 ..... A	93 ..... A	94 ..... B	95 ..... B	96 C	97 ..... B	98 C	99 ..... B	100 ..... A
101 ..... B	102 ..... A	103 ..... A	104 ..... A	105 ..... B	106 ..... D	107 C	108 C	109 ..... D	110 ..... A
111 ..... B	112 ..... A	113 ..... B	114 ..... A	115 ..... D	116 C	117 ..... D	118 C	119 ..... B	120 C
121 C	122 ..... B	123 C	124 ..... A	125 C	126 ..... A	127 ..... D	128 ..... *	129 ..... B	130 ..... A
131 ..... D	132 ..... D	133 ..... B	134 ..... B	135 C	136 ..... D	137 ..... A	138 ..... A	139 ..... B	140 C
141 ..... B	142 ..... A	143 C	144 ..... B	145 ..... D	146 C	147 C	148 C	149 C	150 ..... A