

# SRI SAI COACHING CENTRE

2/25, Raja Mill Road, Madurai – 01.

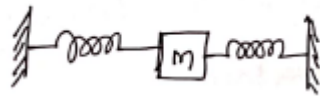
TRB - P.G. Asst. – 2019 - Physics - Model – I

Name : .....

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- Which of the following potential occurs in case of a charge moving in an electromagnetic field  
A)  $u(q_k, p_k)$       B)  $u(q_k, \dot{q}_k)$       C)  $u(q_k, t)$       D)  $u(q_k, \dot{p}_k)$
- A mass  $m$  is connected on either side with a spring each of spring constants  $K_1$  and  $K_2$ . The free ends of springs are tied to rigid supports the displacement of the mass is  $x$  from equilibrium position. Which one of the following is TRUE?



- The force acting on the mass is  $-(K_1 K_2)^{1/2} x$
  - The angular momentum of the mass is zero about the equilibrium point and its Lagrangian is  $\frac{1}{2} m \dot{x}^2 - \frac{1}{2} (K_1 + K_2) x^2$
  - The total energy of the system is  $\frac{1}{2} m \dot{x}^2$
  - The angular momentum of the mass is  $m x \dot{x}$  and the Lagrangian of the system is  $\frac{m}{2} \dot{x}^2 + \frac{1}{2} (K_1 + K_2) x^2$
- If the Lagrangian does not depend on time explicitly
    - The Hamiltonian is constant
    - the Hamiltonian can't be constant
    - the kinetic energy is constant
    - the potential energy is constant
  - The Hamiltonian corresponding to the Lagrangian  $L = ax^2 + by^2 - kxy$  is
    - $\frac{px^2}{2a} + \frac{py^2}{2b} + Kxy$
    - $\frac{px^2}{4a} + \frac{py^2}{4b} - Kxy$
    - $\frac{px^2}{4a} + \frac{py^2}{4b} + Kxy$
    - $\frac{px^2 + py^2}{4ab} + Kxy$
  - If the Lagrangian of a particle moving in one dimensions is given by  $L = \frac{\dot{x}^2}{2x} - V(x)$ , the Hamiltonian is
    - $\frac{1}{2} x p^2 + V(x)$
    - $\frac{\dot{x}^2}{2x} + V(x)$
    - $\frac{1}{2} \dot{x}^2 + V(x)$
    - $\frac{p^2}{2x} + V(x)$
  - The mean free path of the particles of a gas at temperature  $T_0$  and Pressure  $P_0$  has a value  $\lambda_0$ . If the pressure is increased to  $1.5 P_0$  and the temperature is reduced to  $0.75 T_0$ , then mean free path?
    - remains unchanged
    - is reduced to half
    - is doubled
    - is equal to  $1.125 \lambda_0$

7. A paramagnetic system consisting of  $N$  spin-half particles, is placed in an external magnetic field. It is found that  $N/2$  spins are aligned parallel and the remaining  $N/2$  spins are aligned antiparallel to the magnetic field. The statistical entropy of the system is
- A)  $2NK_B \ln 2$       B)  $N/2 \text{ KB } \ln 2$       C)  $3N/2 \text{ KB } \ln 2$       D)  $NK_B \ln 2$
8. For a black body radiation in a cavity, photons are created and annihilated freely as a result of emission and absorption by the walls of the cavity. This is because,
- A) the chemical potential of the photons is zero  
 B) photons obey Pauli exclusion principle  
 C) Photons are spin-1 particles  
 D) the entropy of the photons is very large
9. The wavefunctions of two identical particles in states  $n$  and  $s$  are given by  $\phi_n(r_1)$  and  $\phi_s(r_2)$  respectively. The particles obey M – B statistics. The state of the combined two particles system is expressed as
- A)  $\phi_n(r_1) + \phi_s(r_2)$       B)  $\frac{1}{\sqrt{2}} [\phi_n(r_1) \phi_s(r_2) + \phi_n(r_2) \phi_s(r_1)]$   
 C)  $\frac{1}{\sqrt{2}} [\phi_n(r_1) \phi_s(r_2) - \phi_n(r_2) \phi_s(r_1)]$       D)  $\phi_n(r_1) \phi_s(r_2)$
10. Two particles are said to be distinguishable when
- A) the average distance between them is large compared to their de Broglie wavelength  
 B) the average distance between them is small compared to their de Broglie wavelength  
 C) they have overlapping wavepackets  
 D) their total wave function is symmetric under particle exchange
11. Correct statement(s) about Bose-Einstein condensation?
- i.  $T < \frac{h^2}{2\pi m K_B} \left( \frac{N}{V \xi^{(3/2)}} \right)^{2/3}$       ii.  $T > \frac{h^2}{2\pi m K_B} \left( \frac{N}{V \xi^{(3/2)}} \right)^{2/3}$   
 iii. Number of particles in the ground state is greater than the excited state  
 iv. Number of particles in the excited state is greater than the ground state  
 v. particles in the ground states correspond to the normal component of liquid He-II  
 vi. particles in the ground states correspond to the superfluid component of liquid He-II  
 A) (i), (iii) and (v)    B) (ii), (iv) and (vi)      C) (i), (iii) and (vi)    D) (ii), (iv) and (v)
12. In a first order phase transition, the transition temperature and specific heat of the system are
- A) diverges and its entropy remains the same  
 B) diverges and its entropy has finite discontinuity  
 C) remains unchanged and its entropy has finite discontinuity  
 D) has finite discontinuity and its entropy diverges



20. A magnetic field  $\vec{B} = B_o (\hat{i} + 2\hat{j} - 4\hat{k})$  exists at a point p. If a test charge moving with a velocity  $\vec{V} = V_o (3\hat{i} - \hat{j} + 2\hat{k})$  experiences no force at a certain point. The electric field at the point p is
- A)  $\vec{E} = -V_o B_o (3\hat{i} - 2\hat{j} + 4\hat{k})$       B)  $\vec{E} = +V_o B_o (\hat{i} + \hat{j} + 7\hat{k})$   
 C)  $\vec{E} = V_o B_o (14\hat{j} + 17\hat{k})$       D)  $\vec{E} = -V_o B_o (14\hat{j} + 7\hat{k})$
21. Which of the following statements is not applicable to ferromagnetic materials?
- A) susceptibility  $\chi_m \gg 1$   
 B) it shows the phenomenon of hysteresis  
 C) its permeability has a fixed value  
 D) it can show spontaneous magnetization below certain temperature
22. The equation  $\vec{\nabla} \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$  is the differential form of
- A) Faraday's law    B) Maxwell's equation    C) Ampere's law    D) Lorentz equation
23. Which one of the following is not the method to produce plane polarized light
- A) polarized method      B) plane retardation method  
 C) Beam splitter method      D) Double slit method
24. The time average power flow per unit area in a uniform plane wave is
- A)  $P_{av} = \frac{E}{2H}$       B)  $P_{av} = \frac{E}{2\mu_o H}$       C)  $P_{av} = \frac{E_o}{2\eta_o}$       D)  $P_{av} = \frac{E_o^2}{2\eta_o}$
25. Find the velocity of a plane wave in a lossless medium having a relative permittivity of 5 and relative permeability of unity
- A)  $1.34 \times 10^8 \text{ m/s}$     B)  $3 \times 10^8 \text{ m/s}$     C)  $4.28 \times 10^8$     D) infinity
26. Aspect ratio (a:b) of rectangular metal waveguide to carry only the  $TE_{10}$  mode at a frequency of 5000 MHz is
- A) 1 : 2      B) 2 : 1      C) 1 : 0      D) 0 : 1
27. The capacitor connected between the collector and the tuned circuit of Hartley oscillator is called as
- A) Radio frequency Choke (RFC)      B) Coupling Capacitor (Cc)  
 C) blocking capacitor (C<sub>B</sub>)  
 D) No capacitor is connected only inductor is connected
28. Operating frequency of RC phase shift Oscillator with R = 6 k $\Omega$ , C = 1500 pF and R<sub>c</sub> = 18 K $\Omega$  is
- A) 5.44 KHz      B) 6.18 KHz      C) 7.22 KHz      D) 10 KHz
29. The main function of a clipping circuit is to
- A) remove a certain portion of the input signal above or below a certain level  
 B) Suppress amplitude variations in the input signal voltage  
 C) restore d.c. level to the signal  
 D) Both A and B

30. Flip-Flops are used in a microprocessor to indicate  
 A) shift register                      B) latches                      C) counters                      D) Flags
31. HLT is a / an  
 A) data transfer instruction                      B) arithmetic instruction  
 C) logical instruction                      D) Machine control instruction
32. SUB B instruction in 8085 microprocessor  
 A) resets the carry and sign flag                      B) sets the zero and parity flag  
 C) sets the zero and carry flag                      D) can modify all flags according to result
33. Match the following:  
 P. Doppler Broadening                      -                      1. Moment of inertia  
 Q. Natural Broadening                      -                      2. Refractive index  
 R. Rotational spectrum                      -                      3. Lifetime of the energy level  
 S. Total internal reflection                      -                      4. Pressure
- |        |   |   |   |   |    |   |   |   |   |
|--------|---|---|---|---|----|---|---|---|---|
| Codes: | P | Q | R | S | P  | Q | R | S |   |
| A)     | 4 | 3 | 1 | 2 | B) | 3 | 2 | 1 | 4 |
| C)     | 2 | 3 | 4 | 1 | D) | 1 | 4 | 2 | 3 |
34. Consider the pure rotational spectrum of a diatomic rigid rotor. The separation between two consecutive lines ( $\Delta \bar{\nu}$ ) in the spectrum  
 A) is directly proportional to the moment of inertia of the rotor  
 B) is inversely proportional to the moment of inertia of the rotor  
 C) depends on the angular momentum  
 D) is directly proportional to the square of the interatomic separation
35. Acceleration of a mass in Atwood machine is  
 A)  $\ddot{x} = \left(\frac{M_1+M_2}{M_1-M_2}\right) g$                       B)  $\ddot{x} = \left(\frac{M_1-M_2}{M_1+M_2}\right) g$   
 C)  $\ddot{x} = (M_1 + M_2) g$                       D)  $\ddot{x} = \left(\frac{1}{M_1-M_2}\right) g$
36. Normal frequencies of Linear Triatomic molecule is,  
 A)  $\omega_1 = 0$  ;  $\omega_2 = \sqrt{\frac{k}{m}}$  ;  $\omega_3 = \left(\frac{k}{m}\right)^{3/2} \left(1 + \frac{2m}{M}\right)^{1/2}$   
 B)  $\omega_1 = 0$  ;  $\omega_2 = \sqrt{\frac{k}{m}}$  ;  $\omega_3 = \sqrt{\frac{k}{m} \left(1 + \frac{2m}{M}\right)}$   
 C)  $\omega_1 \neq 0$  ;  $\omega_2 = \sqrt{\frac{k}{m}}$  ;  $\omega_3 = \sqrt{\frac{k}{m} \left(1 + \frac{2m}{M}\right)}$   
 D)  $\omega_1 \neq 0$  ;  $\omega_2 = \sqrt{\frac{k}{m}}$  ;  $\omega_3 = \left(\frac{m}{k}\right)^{3/2} \left(1 + \frac{2m}{M}\right)^{1/2}$
37. Which of the following one gives wide spread physical applications in acoustics, molecular spectra, vibrations of mechanisms and couple electrical circuits  
 A) Theory of small oscillations                      B) Principle of Least action  
 C) Lagrangian formulation                      D) Jacobi's Integral method

38. The first rotation about the vertical axis in Euler angle is called as  
 A) Heading (or) Yaw angle                      B) Pitch (or) Attitude angle  
 C) Roll (or) Bank Angle                        D) Trait – Bryan Angles
39. Lagrange's equations of motion for small Oscillations is  
 A)  $\sum_K (V_{jk} - \omega^2 T_{jk}) a_k = 0$                       B)  $\sum_K (V_{jk} - \omega T_{jk}) a_k = 0$   
 C)  $\sum_K (V_{jk}^2 - \omega T_{jk}) a_k = 0$                       D)  $\sum_K (V_{jk}^2 - \omega T_{jk}^2) a_k = 0$
40. Liouville's Theorem is  
 A)  $\left(\frac{\partial p}{\partial t}\right) + \sum_j \left(\frac{\partial p}{\partial q_j} \dot{q}_j + \frac{\partial p}{\partial p_j} \dot{p}_j\right) = 0$                       B)  $\left(\frac{\partial^2 p}{\partial t^2}\right) + \sum_j \left(\frac{\partial p}{\partial q_j} \dot{q}_j + \frac{\partial p}{\partial p_j} \dot{p}_j\right) = 0$   
 C)  $\left(\frac{\partial p}{\partial t}\right) + \sum_j \left(\frac{\partial p}{\partial q_j} \dot{p}_j + \frac{\partial p}{\partial p_j} \dot{p}_j\right) = 0$                       D)  $\left(\frac{\partial^2 p}{\partial t^2}\right) + \sum_j \left(\frac{\partial p}{\partial q_j} \dot{p}_j + \frac{\partial p}{\partial p_j} \dot{q}_j\right) = 0$
41. Consider a gas of only two particles A, B obeying B-E statistics and each particle be in one of the three possible quantum states 1, 2, 3. How many possible states exist for the whole gas?  
 A) 9    B) 6    C) 3    D) 2
42. A particle of mass 'm' obeys Maxwellian velocity distribution. The average speed of the particle is  
 A)  $\frac{1}{2}KT$     B)  $\sqrt{\frac{2KT}{m\pi}}$     C)  $\frac{3KT}{m}$     D)  $\sqrt{\frac{8KT}{m\pi}}$
43. In NMR the nucleus may be visualized as a rotating spherical charge with  
 A) the magnetic moment pointing along the axis of rotation  
 B) the magnetic moment pointing perpendicular to the axis of rotation  
 C) the magnetic moment inclined to the axis of rotation  
 D) the magnetic moment independent of the axis of rotation
44. A spherical top molecule is one in which  
 A)  $I_A \neq I_B \neq I_C$                       B)  $I_A = I_B \neq I_C$                       C)  $I_A = I_B = I_C$                       D)  $I_A = I_B ; I_C = 0$
45. The selection rule for transition in rotational spectra is  
 A)  $\Delta J = \pm 2$                       B)  $\Delta J = \pm 1$                       C)  $\Delta J = 0$                       D)  $\Delta J = 0, \pm 2$
46. Let  $\alpha$  and  $Q$  are the polarizability and the normal coordinate associated with a particular mode of vibration of the molecule. The condition for no Raman line is  
 A)  $\left(\frac{\partial \alpha}{\partial Q}\right)_0 = 0$                       B)  $\left(\frac{\partial Q}{\partial \alpha}\right)_0 = 0$                       C)  $\left(\frac{\partial \alpha}{\partial Q}\right)_0 \neq 0$                       D)  $\left(\frac{\partial Q}{\partial \alpha}\right)_0 \neq 0$
47. The cavity magnetron uses strapping to  
 A) Prevent mode jumping                      B) Prevent cathode back heating  
 C) Ensure bunching                              D) Improve the phase focusing effect

48. In a microprocessor the register which holds the address of the next instruction to be fetched is  
 A) Accumulator  
 B) Program counter  
 C) Stack counter  
 D) Instructor register
49. Bubble chamber uses  
 A) Super heated liquid  
 B) Super saturated liquid  
 C) Super heated vapour  
 D) Super saturated vapour
50. Synchrotron can accelerate  
 A) Electron and proton  
 B) Electron and neutron  
 C) Proton and neutron  
 D) Neutron and positron
51. An ideal nuclear reactor moderators should have  
 A) High atomic weight and low absorption cross-section for neutrons  
 B) Low atomic weight and low absorption cross section for neutron  
 C) Low atomic weight and high absorption cross-section for neutrons  
 D) High atomic weight and high absorption cross-section for neutrons
52. The diffusion equation is also called as  
 A) Critical equation  
 B) Geiger - Nuttel equation  
 C) Maxwell's equation  
 D) Fermi age equation
53. The scintillation counter works on the principle of  
 A) Electron-hole pair production in the material when particle strikes on it  
 B) Conversion of ultra violet light to visible light  
 C) The emission of light from certain materials when charged particles strike on it  
 D) The carrier generation in the depletion region of a junction when a charged particle strikes on it
54. A photon has the properties except  
 A) Zero intrinsic angular momentum  
 B) Its momentum is  $h\nu/c$   
 C) Its total energy is kinetic  
 D) It has zero rest mass
55. Correct expression for total binding energy B of a nucleus ( $a_1, a_2, a_3, a_4 > 0$ )  
 A)  $B = a_1A - a_2 a^{2/3} - a_3 \frac{z(z-1)}{A^3} - a_4 \frac{(A-2z)^2}{A} + \delta$   
 B)  $B = a_1A + a_2 A^{2/3} - a_3 \frac{z(z-1)}{A^3} - a_4 \frac{(A-2z)^2}{A} + \delta$   
 C)  $B = a_1A + a_2 A^{1/3} - a_3 \frac{z(z-1)}{A^3} - a_4 \frac{(A-2z)^2}{A} + \delta$   
 D)  $B = a_1A - a_2 A^{1/3} - a_3 \frac{z(z-1)}{A^3} - a_4 \frac{(A-2z)^2}{a} + \delta$
56. The correct matching pair of packing fraction of element with atomic mass number is  
 A) Packing fraction is positive  $A > 20$   
 B) Packing fraction is positive  $20 < A < 200$   
 C) Packing fraction is negative  $20 < A < 200$   
 D) Packing fraction is negative  $A < 20$

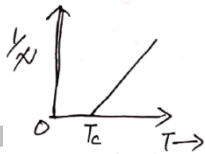
57.  ${}_{92}\text{U}^{233}$  undergoes successively eight  $\alpha$ -decays and six  $\beta$ -decays. What is the resulting nucleus?  
 A)  ${}_{82}\text{Pb}^{202}$       B)  ${}_{82}\text{Pb}^{206}$       C)  ${}_{82}\text{Pb}^{210}$       D)  ${}_{82}\text{Pb}^{214}$   
 A) Enhances the the probability of electron emission and decreases the probability of position emission  
 B) Enhances the probability of position emission and decreases the probability of
58. Deuterons are accelerated in the synchrocyclotron which has magnetic field of 15000 gauss at the centre and 14310 gauss at the periphery of the dee. Calculate the maximum frequency of the dee voltage  
 A) 10.44 Mc/Sec    B) 11.44 Mc/sec    C) 0.944 Mc/sec      D) 0.544 Mc/sec
59. According to Bohr and wheeler's theory of nuclear fission, the maximum deformation in the radius r can be expressed as  
 A)  $r = R \left[ 1 + \sum_{l=0}^{\infty} \alpha_l P_l (\cos \theta) \right]$       B)  $r = R \left[ 1 + \sum_{l=0}^{\infty} \alpha_l^2 P_l^2 (\sin \theta) \right]$   
 C)  $r = R \left[ (1 + \alpha_l) \sum_{l=0}^{\infty} P_l^2 (\sin^2 \theta) \right]$       D)  $r = R \sum_{l=0}^{\infty} \alpha_l P_l \cos \theta$
60. In Fermi's theory of beta decay, the Coulomb correction  
 A) Enhances the probability of electron emission and decreases the probability of position emission  
 B) Enhances the probability of position emission and decreases the probability of electron emission  
 C) Enhances the probability of both position and electron emission  
 D) Decreases the probability of both positron and electron emission
61. According to Lorentz transformation, if  $v > c$  then the quantity  $\sqrt{1 - v^2/c^2}$  becomes  
 A) Real    B) Imaginary    C) zero    D) Infinity
62. Which one of the following is not the postulate of special theory of relativity?  
 A) The laws of physics have not same for all inertial frames  
 B) The laws of physics have same for all inertial frames  
 C) The speed of light in free space is always constant  
 D) The speed of light in free space is independent of the source and the observer
63. If A and B are two event them p(A+B)  
 A) probability of occurrence of at least one of the event s A, B  
 B) probability of occurrence of both the events A and B  
 C) conditional probability for event A  
 D) conditional probability for event B
64. In between two groups, if one to one correspondence exists between their elements then it is called  
 A) Heteromorphism      B) Isomorphism  
 C) Homomorphism      D) none of these



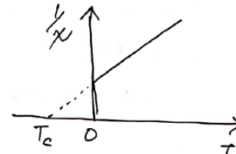


72. The valence electrons do not directly determine the following property of a metal  
 A) electrical conductivity                      B) thermal conductivity  
 C) shear modulus                                D) metallic luster
73. Which one of the following cannot be explained by considering a harmonic approximation for the lattice vibration in solids?  
 A) Debye's  $T^3$  law                                B) Dulong – Petit's law  
 C) Optical branches in lattices                D) Thermal expansion
74. In a one-dimensional Kronig-Penney model, the total number of possible wave function is equal to  
 A) twice the number of unit cells              B) Number of unit cells  
 C) half the number of unit cells                D) independent of the number of unit cells
75. The Bloch theorem states that within a crystal, the wavefunction  $\psi(\vec{r})$ , of an electron has the form  
 A)  $\psi(\vec{r}) = u(\vec{r}) e^{i\vec{k} \cdot \vec{r}}$ , where  $u(\vec{r})$  is an arbitrary function and  $\vec{k}$  is an arbitrary vector  
 B)  $\psi(\vec{r}) = u(\vec{r}) e^{i\vec{G} \cdot \vec{r}}$ , where  $u(\vec{r})$  is an arbitrary function and  $\vec{G}$  is a reciprocal lattice vector  
 C)  $\psi(\vec{r}) = u(\vec{r}) e^{i\vec{G} \cdot \vec{r}}$ , where  $u(\vec{r}) = u(\vec{r} + \vec{A})$ ,  $\vec{A}$  is a lattice vectors  
 D)  $\psi(\vec{r}) = u(\vec{r}) e^{i\vec{k} \cdot \vec{r}}$ , where  $u(\vec{r}) = u(\vec{r} + \vec{A})$ ,  $\vec{A}$  is a lattice vectors and  $\vec{k}$  is an arbitrary vector
76. The plot of inverse susceptibility ( $1/\chi$ ) versus temperature ( $T$ ) of an antiferromagnetic sample corresponds to

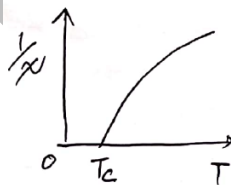
A)



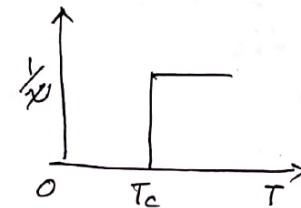
B)



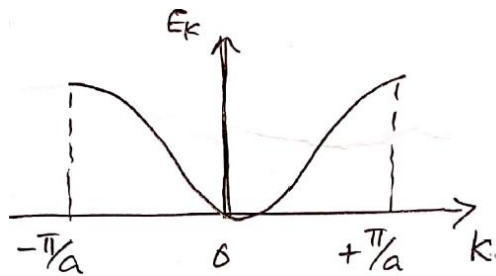
C)



D)

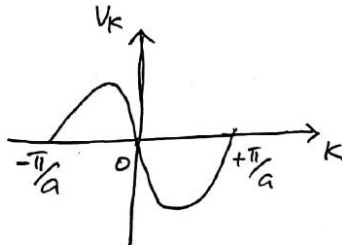


77. The energy  $E_K$  for band electrons as a function as a function of the wave vector  $K$  in the first Brillouin zone ( $-\pi/a \leq K \leq \pi/a$ ) of a one-dimensional monoatomic lattice is shown as,

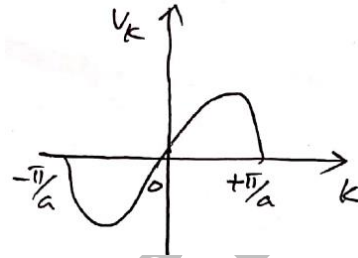


The variation of the group velocity  $U_K$  is most appropriately represented by

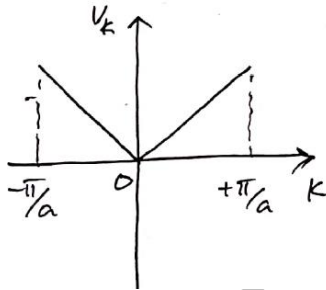
A)



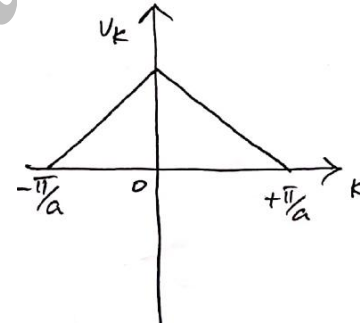
B)



C)



D)



78. The normalized wave function of a particle is

A)  $\psi_n = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$

B)  $\psi_n = \sqrt{\frac{2}{L}} \sin\left(\frac{n\pi x}{L}\right)$

C)  $\psi_n = \frac{2}{L} \sqrt{\sin\left(\frac{n\pi x}{L}\right)}$

D)  $\psi_n = \frac{2}{L} \sin\left(\frac{n\pi x}{L}\right)$

79. The transition probability per unit normalised

A) non-zero only between continuum states of same energy

B) non-zero between states of same energy

C) zero only between continuum states of same energy

D) zero between states of same energy

80. The Schrodinger's time independent wave equation for a free particle is

A)  $\nabla^2 \psi + \frac{2m}{\hbar^2} E \psi = 0$

B)  $\nabla^2 \psi + \frac{2m}{\hbar^2} V \psi = 0$

C)  $\nabla^2 \psi + \frac{2m}{\hbar^2} (E - V) \psi = 0$

D)  $\nabla^2 \psi + \frac{2m}{\hbar^2} (V - E) \psi = 0$

81. Give the Remarks about the statements below:
- Perturbation removes the degeneracy of the corresponding eigen value of the unperturbed Hamiltonian  $H_0$ .
  - Commuting operators have different set of eigen functions
  - According to Fermi's golden rule, transitions can occur only between states of equal energies and the probability density of transition increases linearly with time
- Codes:
- Statement (a) is wrong and (b) and (c) are correct
  - Statements (a) and (b) are correct and (c) is wrong
  - Statements (a) and (c) are correct and (b) is wrong
  - None of the above
82. The state of a free particle is described by the following wave function
- $$\Psi(x) = \begin{cases} 0 & \text{for } x < -3a \\ c & \text{for } -3a < x < a \\ 0 & \text{for } x > a \end{cases}$$
- using the normalization condition, the value of C is determined as
- $C = \frac{1}{2\sqrt{a}}$
  - $C = \frac{1}{2a}$
  - $C = \frac{1}{4a}$
  - $C = \frac{1}{4\sqrt{a}}$
83. Consider the following statement about molecular spectra
- $\text{CH}_4$  does not give pure rotational Raman lines
  - $\text{SF}_6$  could be studied by rotational Raman spectroscopy
  - $\text{N}_2$  shows infrared absorption spectrum
  - $\text{CH}_3\text{CH}_3$  shows vibrational Raman and IR absorption lines
  - $\text{H}_2\text{O}_2$  shows pure rotational spectrum
- Choose the right combination of correct statements
- 1 and 2
  - 1, 3 and 5
  - 1, 4 and 5
  - 2 and 3
84. The number of fundamental vibrational modes of  $\text{CO}_2$  molecule is
- Four : 2 are Raman active and 2 are IR active
  - Four : 1 is Raman active and 3 are IR active
  - Three : 1 is Raman active and 2 are IR active
  - Three : 2 are Raman active and 1 is IR active
85. In Raman effect, the wavelength of the incident radiation is  $5890 \text{ \AA}$ . The wavelengths of stoke's and anti-stoke's lines are respectively
- $5880 \text{ \AA}$  and  $5900 \text{ \AA}$
  - $5900 \text{ \AA}$  and  $5880 \text{ \AA}$
  - $5900 \text{ \AA}$  and  $5910 \text{ \AA}$
  - $5870 \text{ \AA}$
86. Choose the INCORRECT Statement:
- $^{13}\text{C}$  nuclei always have resonance at a frequency lower than proton
  - Gyromagnetic ratio of  $^{13}\text{C}$  nucleus is smaller than that of hydrogen
  - The resonances of proton ( $^1\text{H}$ ) are more difficult to observe than those of  $^{13}\text{C}$
  - $^{13}\text{C}$  nuclei, with nuclear spin  $I = \frac{1}{2}$  are important in determining the structure of organic molecules

87. Condition for orthogonality in curvilinear coordinates  
 A)  $\frac{\partial r}{\partial u} \cdot \frac{\partial r}{\partial v} = 0$     B)  $\frac{\partial r}{\partial v} \cdot \frac{\partial r}{\partial w} = 0$     C)  $\frac{\partial r}{\partial w} \cdot \frac{\partial r}{\partial u} = 0$     D) All of these
88. Any two eigen vectors corresponding to two distinct eigen values of a Hermitian matrix are  
 A) Parallel    B) Equal    C) Orthogonal    D) Not equal
89. The rank of the matrix  $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ -1 & -3 & -4 & -1 \end{bmatrix}$  is  
 A) 3    B) 1    C) 2    D) 4
90. A matrix satisfies equation  $A^2 - 3A + 30I = 0$ . Then its eigen values are  
 A)  $\frac{3 \pm i\sqrt{111}}{2}$     B)  $\frac{2 \pm i\sqrt{111}}{2}$     C)  $\frac{3 \pm i\sqrt{85}}{2}$     D)  $\frac{2 \pm i\sqrt{85}}{2}$
91. The equation  $x \frac{d^2y}{dx^2} + (1-x) \frac{dy}{dx} + vy = 0$  is called  
 A) Legendre equation    B) Hermite equation  
 C) Chebyshev equation    D) Laguerre equation
92. Choose the correct statement  
 A)  $\Gamma_n = (n-1)\Gamma_{(n-1)}$     B)  $\Gamma_n = (n-1)\Gamma_n$   
 C)  $\Gamma_n = (n+1)\Gamma_1$     D)  $\Gamma_n = n$
93. Range of  $r$  in spherical coordinates  $(r, \theta, \phi)$  is  
 A)  $(-\infty, \infty)$     B)  $[0, \infty)$     C)  $(0, \infty)$     D)  $(0, 2\pi)$
94.  $\text{div}(\phi \bar{A}) =$   
 A)  $\phi \text{grad} \bar{A} + \bar{A} \text{grad} \phi$     B)  $\phi \text{div} A + \bar{A} \cdot \text{grad} \phi$   
 C)  $\phi \text{grad} A + \text{div} A$     D)  $\phi \text{div} A - \bar{A} \cdot \text{grad} \phi$
95.  $\text{Curl}(uv) =$   
 A)  $u \text{curl} v + v \text{curl} u$     B)  $u \text{curl} v - v \text{curl} u$   
 C)  $u \text{curl} v + (\text{grad} u) \times v$     D)  $u \text{curl} v + (\text{grad} u) \cdot v$
96. If  $\int \mathbf{F} \cdot d\mathbf{v} = 0$  then the force  $\bar{F}$  and system is  
 A) Solenoidal    B) Conservative    C) Irrotational    D) None of these
97. Choose the correct statements:  
 A) The eigen vectors corresponding to distinct characteristic roots of a matrix are linearly dependent  
 B) The modulus of each eigen value of a unitary matrix is unity  
 C) A square matrix sometimes does not satisfy its characteristic equation  
 D) If  $A$  is Hermitian  $-iA$  is Skew Hermitian
98. If  $a, b$  are any two elements of a group  
 A)  $a$  and  $b^{-1}ab$  are of same order    B)  $a$  and  $b^{-1}ab$  are of different order  
 C) The order of  $a$  is less than order of  $b^{-1}ab$   
 D) The order of  $a$  is more than order of  $b^{-1}ab$

99. which of the following is NOT a group  
 A)  $(M_2(\mathbb{R}), +)$       B)  $(\mathbb{Z}_p - \{0\}, \odot_p)$       C)  $(\mathbb{N}, +)$       D)  $(\mathbb{R}, \odot)$
100. I All cyclic groups are abelian  
 II The order of cyclic group is same as the order of its generator  
 A) I and II are false      B) I is true II is false  
 C) I and II are true      D) I is false II is true
101. Every group of prime order is  
 A) Cyclic      B) Abelian      C) Cyclic and abelian      D) abelian but not cyclic
102. If H and K are two sub groups of order 8 and 12 respectively then  $O(HK)$  is 24, if  $O(H \cap K)$  is  
 A) 16      B) 8      C) 4      D) 2
103. Let G be the set of all  $2 \times 2$  matrices  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  where a, b, c, d are real numbers such that  $ad - bc \neq 0$  is a group then  
 i) G is abelian under multiplication      ii) G is non-abelian group  
 iii) The inverse of  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  is  $\begin{pmatrix} \frac{d}{ad-bc} & \frac{-b}{ad-bc} \\ \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{pmatrix}$   
 iv) The inverse of  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  is  $\begin{pmatrix} \frac{a}{ad-bc} & \frac{b}{ad-bc} \\ \frac{c}{ad-bc} & \frac{d}{ad-bc} \end{pmatrix}$   
 A) i, iv      B) ii, iii      C) ii, iv      D) i, iii
104. The identity element of the multiplicative group  $\{2^n : n \in \mathbb{Z}\}$  is .....  
 A) 0      B) 1      C)  $1/2$       D)  $1/3$
105. The number of generator in cyclic group of order 10 are .....  
 A) 1      B) 2      C) 3      D) 4
36. Let  $J(\sqrt{2})$  be the ring of all real numbers of the form  $m + n\sqrt{2}$ , where m, n are integers with the usual addition and multiplication. then the Kernel of the homomorphism  $\phi : J(\sqrt{2}) \rightarrow J(\sqrt{2})$  defined by  $\phi(m + n\sqrt{2}) = m - n\sqrt{2}$  is  
 A)  $J\sqrt{2}$       B) empty      C) 0      D)  $\sqrt{2}$
37. Which one of the following is not an abelian group?  
 A)  $(\mathbb{Z}, +)$       B)  $(\mathbb{Q}, +)$       C)  $(\mathbb{R}, +)$       D)  $(\mathbb{Z}, \bullet)$
39. Which of the following examples are true?  
 i) Let  $G = S_3$  and  $\bar{G} = \{e, a\}$  and  
 Then  $f : G \rightarrow \bar{G}$  by  $f(a^i b^j) = a^i$  is a homomorphism  
 ii) Let  $G = \{\mathbb{R} - \{0\}, \cdot\}$  and  $\bar{G} = \{1, -1\}$   
 Then  $f : G \rightarrow \bar{G}$  by  $f(x) = \begin{cases} 1 & \text{if } x \text{ is positive} \\ -1 & \text{if } x \text{ is negative} \end{cases}$  is a homomorphism  
 iii) Let  $G = \{\mathbb{R}^+, \cdot\}$  and  $\bar{G} = \{\mathbb{R}, +\}$   
 Then  $f : G \rightarrow \bar{G}$  by  $\phi(x) = \log_{10} x$  is an isomorphism

iv) Let  $G$  be the group of all  $2 \times 2$  matrices  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  such that  $ad - bc \neq 0$  under matrix multiplication and let  $\bar{G} = \{R - \{0\}, \cdot\}$  then  $f : G \rightarrow \bar{G}$  by  $f \left( \begin{pmatrix} a & b \\ c & d \end{pmatrix} \right) = ad - bc$  is a homomorphism

A) i and ii true      B) iii is true      C) all are true      D) all are false

109. The eigen values of the matrix  $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$  are

A) 1, 2, 3      B) 1, 1, 5      C) 1, 3, 5      D) 2, 4, 6

110. The relation between Beta and Gamma functions is

A)  $\beta(m, n) = \frac{\sqrt{m} + \sqrt{n}}{\sqrt{m} \sqrt{n}}$       B)  $\beta(m, n) = \frac{\sqrt{m} \sqrt{n}}{\sqrt{m} + \sqrt{n}}$   
 C)  $\beta(m, n) = \frac{\sqrt{m} \sqrt{n}}{\sqrt{(m+n)}}$       D)  $\beta(m, n) = \frac{\sqrt{(m+n)}}{\sqrt{m} \sqrt{n}}$

111. How many steps involved in Herbaton lesson planning

பாடத்திட்டம் தொடர்புடைய ஹெர்பார்டன் படிநிலைகள் எத்தனை

A) 7      B) 6      C) 8      D) 9

112. Which of the following was established in 1961?

1961-ல் வரைவுபடுத்தப்பட்ட ஒன்று எது?

A) DTERT      B) DIET      C) NCERT      D) NAAC

113. Equality in Education suggested by

A) Sargeant Report      B) Kothari Commission  
 C) Hunter Commission      D) UGC

கல்வியில் சமவாய்ப்பு அளித்த கல்விக்குழு

A) சார்ஜண்ட் உடன்படிக்கை      B) கோத்தாரி கல்விக்குழு  
 C) ஹண்டர் குழு      D) UGC

114. Sainik School located in the District of

A) Kovai      B) Thirupur      C) Erode      D) Dindugal

சைனிக்பள்ளி அமைந்துள்ள மாவட்டம்

A) கோவை      B) திருப்பூர்      C) ஈரோடு      D) திண்டுக்கல்

115. In which school Widely followed Pestolozzies approach?

A) Nursery      B) Montessori      C) Kindergarden      D) Anganwadi

பெஸ்டாலஜியின் அணுகுமுறைகளை பின்பற்றும் பள்ளி எது?

A) நர்சரி      B) மாண்டிசோரி      C) கிண்டர்கார்டன்      D) அங்கன்வாடி

116. Article 15 (3) mainly insists

A) Womens Education      B) Free Education  
 C) Children's Education      D) A & C

அரசியல் சாசன விதி 15(3) கூறுவது

A) பெண்கல்வி      B) இலவச கல்வி  
 C) குழந்தைக் கல்வி      D) A மற்றும் C

117. Environmental protection Act was passed by the parliament in the year of

சுற்றுச்சூழல் பாதுகாப்புச் சட்டம் பாராளுமன்றத்தில் நிறைவேற்றப்பட்ட ஆண்டு

A) 1987      B) 1986      C) 1974      D) 1966

118. A person related to Adult Education  
 A) Braille B) Bryson C) Parker D) B & C  
 வயது வந்தோர் கல்வியுடன் தொடர்புடையவர்கள்  
 A) ப்ரெய்லி B) பிரைசன் C) பர்கர் D) B & C
119. Meaning of Education is  
 A) Learning B) Bringout C) Cultivate D) All of these  
 கல்வி என்பதன் பொருள்  
 A) கற்றல் B) வெளிக் கொணர்தல் C) வளர்ப்பது D) அனைத்தும்
120. Who Invent "Teaching Machine"  
 A) Galaxo B) Faulkner C) Glacier D) Sydney pressy  
 கற்பித்தல் இயந்திரத்தினை உருவாக்கியவர்  
 A) காலக்ஸோ B) பால்க்னர் C) கிளேசியர் D) சிட்னி ப்ரெஸ்ஸி
121. Society Based Educationist  
 A) Russell B) Morgan C) Maxwell D) Morne  
 சமூகக் கல்வியாளர்  
 A) ரஸல் B) மார்கன் C) மாக்ஸ்வெல் D) மார்னே
122. Wastage & stagnation defined by  
 A) Kothari Commission B) UGC  
 C) Hartog Committee D) Hunter Commission  
 கழிவு மற்றும் தேக்கத்தினை வரையறை செய்த கமிட்டி எது?  
 A) கோத்தாரி குழு B) UGC  
 C) ஹார்டாக் குழு D) ஹண்டர் குழு
123. 'OB' Scheme recommended by  
 A) 1965 Policy B) 1991 Policy C) 1986 Policy D) 1979 Policy  
 "OB" திட்டத்தினை வெளியிட்ட கல்விக்குழு  
 A) 1965 கல்விக்கொள்கை B) 1991 கல்விக்கொள்கை  
 C) 1986 கல்விக்கொள்கை D) 1979 கல்விக்கொள்கை
124. Cognitive stages analysed by  
 A) Bloom B) Bruner C) Maslow D) Wundt  
 அறிவுசார் நிலையினை பகுப்பாய்வு செய்தவர்  
 A) புளூம் B) புருனர் C) மாஸ்லோ D) உண்ட்
125. 'Udisha project' means  
 A) ICDS training B) NCC C) NRC D) JRC  
 "உதிஸ்ஸா திட்டம்" எனப்படுவது  
 A) ICDS பயிற்சி திட்டம் B) NCC C) NRC D) JRC
126. IQ Variation 110-119 comes Under  
 A) Gifted Persons B) Average Persons C) Genius D) talented Persons  
 110-119 நுண்ணறிவு உடையோரின் வகைப்பாடு  
 A) மீத்திறன் மிக்கோர் B) சராசரி திறன் படைத்தோர்  
 C) மேதைகள் D) திறன் மிக்கோர்
127. Vicerotonia, Cerebrotonia, Somatotonia are of classified by  
 A) Sheldon B) Kretchmer C) Carl Jung D) Ogburn  
 சுக விருப்பமுள்ள ஆளுமை, சிந்தனை சார் ஆளுமை, செயல்சார் ஆளுமை,  
 என வகைப்படுத்தியவர்  
 A) ஷெல்டன் B) கிரெட்சுமர் C) காரல்யூங் D) ஆக்பர்ன்



128. "Schizo phrenia" is a kind of defence mechanism  
 A) Identification B) Retionalization C) Regression D) Scapogotism  
 "ஷிஷோப்ரினியா" என்ன வகையான நடத்தை  
 A) ஒன்றுதல் B) காரணம் கற்பித்தல்  
 C) பின்னோக்கம் D) பலிகடா ஆக்கப்படுதல்
129. Branch of Psychology is mainly focused Adolescence  
 A) Educational Psychology B) General Psychology  
 C) Child Psychology D) Growth Psychology  
 குமரப்பருவம் பற்றி படிக்கும் உளவியலின் பிரிவு?  
 A) கல்வி உளவியல் B) பொது உளவியல்  
 C) குழந்தை உளவியல் D) வளர்ச்சி உளவியல்
130. Who told that "Psychology is a Behavior Science"  
 A) Mc Doug all B) Watson C) Skinner D) Titchner  
 உளவியல் நேர்மறை நடத்தை அறிவியல் என்று கூறியவர்  
 A) மக்டூகல் B) வாட்சன் C) ஸ்கினர் D) டிட்சனர்
131. Who Introduced Individual Psychology?  
 A) Sigmen Freud B) Jung C) Adler D) Williamson  
 தனிநபர் உளவியலை தோற்றுவித்தவர்  
 A) சிக்மண்ட் ப்ராய்டு B) யூங் C) ஆடலர் D) வில்லியம் சன்
132. Attention theory formulated by  
 A) Ditchner B) Wundt C) Watson D) Hebb  
 கவன கோட்பாடு  
 A) டிட்சனர் B) உண்ட் C) வாட்சன் D) ஹெப்
133. How many Chromosomes are present in a female germ cell?  
 பெண் இனச்செல்லில் காணப்படும் குரோமோசோமின் எண்ணிக்கை  
 A) 46 B) 23 C) 23 + 23 D) 46 + 23
134. Physical Growth factor determinate by  
 A) Heredity B) Environment  
 C) Heredity & Environment D) None of these  
 உடல் வளர்ச்சியை தீர்மானிப்பது  
 A) மரபு B) சூழ்நிலை C) மரபும், சூழ்நிலையும் D) எதுவுமில்லை
135. How many chromosomes are present in the cells released by meiosis cell division?  
 A) 23 Pairs of Chromosome B) 23 Chromosome  
 C) 46 Chromosome D) 46 Pairs of Chromosome  
 மியாஸிஸ் பகுப்பினால் செல்களில் காணப்படும் குரோமோசோம்களின் எண்ணிக்கை  
 A) 23 ஜோடி குரோமோசோம் B) 23 குரோமோசோம்  
 C) 46 குரோமோசோம் D) 46 ஜோடி குரோமோசோம்
136. Who had done Kalli kock test  
 A) Goddard B) Calvin C) Amala & Kamala D) Cyrillburt & Shankar  
 காலிகாக் சோதனை யாரால் செய்யப்பட்டது?  
 A) கொட்டர்டு B) கால்வின்  
 C) அமலா & கமலா D) சிரில்பர்ட் மற்றும் சங்கர்

137. Moral relativism is Connected to which one of the following developmental stage?  
 A) Adolescence B) Old Age C) Childhood D) Pre child hood  
 ஒழுக்கம் பற்றிய சார்பு நோக்கம் எப்பருவத்துடன் தொடர்புடையது ?  
 A) குமர்ப்பருவம் B) முதிர் பருவம்  
 C) குழந்தை பருவம் D) முன் குழந்தைப்பருவம்
138. Inferiority Complex arise from which stage  
 A) Adolescence B) 2<sup>nd</sup> year C) 6<sup>th</sup> year D) 0-2 years  
 தாழ்வுணர்வு நிலை தோன்றுவது  
 A) குமர்ப்பருவம் B) 2ம் ஆண்டு  
 C) 6 ஆம்ஆண்டு D) 0-2 வயது வரை
139. J.B. Watson proposed ..... type of Emotions  
 J.B. வாட்சன் குறிப்பிடுகின்ற மனவெழுச்சிகள்  
 A) 2 B) 4 C) 3 D) 5
140. Co operation under which development?  
 A) Physical B) Moral C) Social D) Emotional  
 ஒத்துழைப்பு எவ்வகை வளர்ச்சி?  
 A) உடல்நீதியான B) ஒழுக்க C) சமூக D) மனவெழுச்சி
141. Who is called as father of modern computer  
 A. Bill Gakes B. Michael Faraday C. Alexander Fleming D. Charles Babbage  
 நவீன கணினியின் தந்தை என அழைக்கப்படுபவர்?  
 A) பில் கேட்ஸ் B) மைக்கேல் பாரடே  
 C) அலெக்ஸ்சான்டர் பிளமிங் D) சார்லஜ் பாபேஜ்
142. Which of following stacks were created in 1987?  
 A. Goa only B. Goa and Arunachal Pradesh  
 C. Arunachal Pradesh only D. None of these  
 1987-ல் உருவாக்கப்பட்ட மாநிலம்  
 A) கோவா மட்டும் B) கோவா மற்றும் அருணாசல பிரதேசம்  
 C) அருணாசல பிரதேசம் D) எதுவுமில்லை
143. Which of the following articles makes the super court a court of record?  
 கீழ்க்கண்ட எந்த விதி உச்சநீதிமன்றத்தின் பதிவுகளைப் பற்றி கூறுகிறது  
 A. 125 B. 127 C. 129 D. 131
144. In which year planning commission was established in India?  
 திட்டக்கமிஷன் இந்தியாவில் அமைக்கப்பட்ட ஆண்டு  
 A. 1950 B. 1952 C. 1951 D. 1949
145. Wimbledon is place associated with of the following sports?  
 A. Badminton B. Cricket C. Lawn tennis D. Hockey  
 விம்பிள்டன் என்ற இடம் கீழ்க்கண்ட விளையாட்டுக்காக அமைக்கப்பட்டுள்ளது  
 A) பேட்மிட்டன் B) கிரிக்கெட் C) டென்னிஸ் D) ஹாக்கி
146. Largest National Park in North east in India is Located at?  
 A. Assam B. Mizoram C. Arunachal Pradesh D. Nagaland  
 வடகிழக்கு இந்தியாவில் உள்ள மிகப் பெரிய தேசிய நூங்கா அமைந்துள்ள மாநிலம்  
 A) அஸ்ஸாம் B) மிசோரம் C) அருணாசலப்பிரதேசம் D) நாகலாந்து
147. Where was the First Tamil Sangam held?  
 A. South Madurai B. Kapatapuram C. Kaveripattinam D. Nellai  
 முதல் தமிழ்ச் சங்கம் நடைபெற்ற இடம்

- A) தென்மதுரை      B) கபாடபுரம்      C) காவேரிப்பட்டினம்      D) நெல்லை
148. Bhutan does not share its border with which Indian state?  
A. West Bengal      B. Arunachal Pradesh      C. Meghalaya      D. Sikkim  
முடான் நாடு எந்த இந்திய மாநிலத்தின் எல்லையை பகிர்ந்து கொள்ளவில்லை?  
A) மேற்கு வங்காளம்      B) அருணாச்சலப்பிரதேசம்      C) மேகாலயா      D) சிக்கிம்
149. Which of the following is the full form of U.S.S.R?  
U.S.S.R—ன் விவரிவாக்கம்?  
A. Union of Soviet Socialist Republics      B. Union of Soviet secular Republics  
C. Union of secular Soviet Republics      D. Union of secular socialist republics
150. What does OS stand for?  
OS –ன் விவரிவாக்கம்  
A. Operating software      B. Operating System  
C. Operating status      D. Operating supplier

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14.09.19

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