## EE24BTECH11010 - BALAJI B

c) Hermitian

1) The eigenvalues of a matrix are i, -2i and 3i. The matrix is

a) unitary

(2007-PH)

b) anti-unitary	d) anti-Hermitian
2) A space station moving in a orbit by firing its engine radi	circular orbit around the Earth goes into a new bound ally outwards. The orbit is (2007-PH)
<ul><li>a) A larger circle</li><li>b) a smaller circle</li></ul>	<ul><li>c) an ellipse</li><li>d) a parabola</li></ul>
3) A power amplifier gives 150	W output for an input of 1.5W. The gain, in $dB$ , is (2007-PH)
<ul><li>a) 10</li><li>b) 20</li></ul>	c) 54 d) 100
-Q at $(-1,0)$ , $+Q$ at $(0,1)$ a	ed in a plane at the following positions: $+Q$ at $(1,0)$ , and $-Q$ at $(0,-1)$ . At large distances the electrostatic distribution will be dominated by the (2007-PH)
<ul><li>a) monopole moment</li><li>b) dipole moment</li></ul>	<ul><li>c) quadrupole moment</li><li>d) octopole moment</li></ul>
displacement current reduces  a) stored entirely in its magnetic b) stored entirely in its electric	
P. Franck-hertz experiment Q. Hartee-Fock method R. Stern-Gerlach experiment S. Frank-Condon principle	<ol> <li>electronic excitation of molecules</li> <li>wave function of atoms</li> <li>spin angular momentum of atoms</li> <li>energy levels in atoms</li> </ol>

(2007-PH)

7) The wave function of a particle, moving in a one-dimensional time-independent potential V(x), is given by  $\Psi(x) = e^{-iax+b}$ , where a and b are constants. This means that the potential V(x) is of the form (2007-PH)

a)  $V(x) \propto x$ 

b)  $V(x) \propto x^2$ 

c) V(x) = 0d)  $V(x) \propto e^{-ax}$ 

8) The  $D_1$  and  $D_2$  lines of  $Na\left(3^2P_{\frac{1}{2}} \to 3^2S_{\frac{1}{2}}, 3^2P_{\frac{3}{2}} \to 3^2S_{\frac{1}{2}}\right)$  will split on the application of a weak magnetic field magnetic field into

- a) 4 and 6 lines respectively
- c) 6 and 4 lines respectively

b) 3 lines each

d) 6 lines each

9) In a He - Ne laser transition takes place in

(2007-PH)

a) He only

c) Ne first, then in He

b) Ne only

d) He first, then in Ne

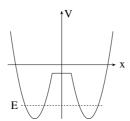
10) The partition function of a single gas molecule is  $Z_{\alpha}$ . The partition function of N such non-interacting gas molecules is then given by (2007-PH)

a)  $\frac{(Z_a)^N}{N!}$ b)  $(Z_a)^N$ 

c)  $N(Z_{\alpha})$ d)  $\frac{(Z_{\alpha})^{N}}{N}$ 

11) A solid superconductor is placed in an external magnetic field and then cooled below its critical temperature. The superconductor (2007-PH)

- a) retains its magnetic flux because the surface current supports it.
- b) expels out its magnetic flux because it behaves like a paramagnetic material
- c) expels out its magnetic flux because it behaves like an anti-ferromagnetic material
- d) expels out its magnetic flux because the surface current induces a field in the opposite to the applied magnetic field
- 12) A particle with energy E is a time-independent double well potential as shown in the figure. (2007-PH)



Which of the following statements about the particle is **NOT** correct?

(2007-PH)

- a) The particle will always be in a bound state
- b) The probability of finding the particle in one well will be time-dependent
- c) The particle will be confined to any one of the wells
- d) The particle can tunnel from one well to the other, and back.
- 13) It is necessary to apply quantum statistics to a system of particles if

(2007-PH)

- a) there is substantial overlap between the wavefunctions of the particles
- b) the mean free path of the particles is comparable to the inner-particle seperation.
- c) the particle have identical mass and charge
- d) the particle are interacting.
- 14) When liquid oxygen is poured down close to a strong bar magnet, the oxygen stream is (2007-PH)
  - a) repelled towards the field because it is diamagnetic.
  - b) attracted towards the higher field because it is diamagnetic.
  - c) repelled towards the lower field because it is paramagnetic.
- d) attracted towards the higher field because it is paramagnetic.
- 15) Fission fragments are generally radioactive as

(2007-PH)

- a) they have excess of neutrons.
- b) they have excess of protons.
- c) they are products of radioactive nuclides.
- d) their total kinetic energy is of the order of 200MeV.
- 16) In a typical npn transistor the doping concentrations in emitter, base and collector regions are  $C_E$ ,  $C_B$  and  $C_E$  respectively. These satisfy the relation (2007-PH)

a) 
$$C_E > C_C > C_B$$

c) 
$$C_C > C_B > C_E$$

b) 
$$C_E > C_B > C_C$$

d) 
$$C_E = C_C > C_B$$

17) The allowed states for  $He(2p^2)$  configuration are

(2007-PH)

a) 
$${}^{1}S_{0}$$
,  ${}^{3}S_{1}$ ,  ${}^{1}P_{1}$ ,  ${}^{3}P_{0,1,2}$ ,  ${}^{1}D_{2}$  and  ${}^{3}D_{1,2,3}$ 

- b)  ${}^{1}S_{0}$ ,  ${}^{3}P_{0,1,2}$  and  ${}^{1}D_{2}$
- c)  ${}^{1}P_{1}$  and  ${}^{3}P_{0,1,2}$
- d)  ${}^{1}S_{0}$  and  ${}^{1}P_{1}$