PES UNIVERSITY   **PESSAT 2017**

Thursday, August 24, 2017

Sample Question for BE TEST

MATHEMATICS

1	If $f(x) = 2x + 3$, $g(x) = 1 - x^2$ then the values of x that satisfy the equation $g \circ f(x) = 0$ are (a) 2, -2 (b) 1, -2 (c) 0, 3 (d) **-1 , -2**
2	Which one of the following is the solution of the equation $\sec^2 x - 2 \tan x = 4$? (a) $\pi / 2$ (b) $\pi / 3$ (c) **$-\pi / 4$** (d) $\pi / 6$
3	If the argument of the complex number is $\pi / 2$ then the value of a is ....
4	Which of the following statements is not true ? (a) $2^n > n$ for all positive integers n. (b) For every positive integer n , $8^n - 5^n$ is divisible by 3. (c) $1^2 + 2^2 + 3^2 + ... + n^2 >$ for all natural numbers n. (d) **$n(n+1)(n+5)$ is not a multiple of 3 where n is a positive integer.**
5	From 7 consonants and 5 vowels, how many words (with or without meaning) can be formed consisting of 3 different consonants and 2 different vowels? (a) 350 (b) **42,000** (c) 4,200 (d) 21,000
6	If in a sequence the first term is $a_1 = -3$ and the nth term is $a_n = 1 - 2 a_{n-1}$, what is the fourth term of the sequence ? (a) **27** (b) -21 (c) 31 (d) -25
7	If the mean of the data 9, x, 5, x, 12, 10, 18, 4, 7, 18, 21 is known to be 10, what is the value of x ? (a) 6 (b) 2 (c) **3** (d) 1
8	The length of latus rectum of the ellipse $36x^2 + 4y^2 = 144$ is

(a) 4/9   (b) **4/3**   (c) 8/3   (d) 36

9 | If R_1 and R_2 are two equivalence relations on a non-empty set A, then
(a) R_1 UR_2 is an equivalence relation on A
(b) **$R_1 \cap R_2$ is an equivalence relation on A**
(c) $R_1 - R_2$ is an equivalence relation on A
(d) None of these

10 | If w is a complex cube root of unity and A = , then A^{98} is equal to
(a) w I   (b) w ^{2} (c) **A^2**   (d) A itself

11 | If y = 1 + + ... to infinity where x > 1 then   dy / dx is

(a)   (b)   (c)   (d)

12 | If a man of height 6 ft walks at a uniform speed of 9 ft / sec from a lamp of height 15 ft then the length of his shadow is increasing at the rate of
(a) **6 ft / sec**   (b)   12 ft / sec   (c) 10 ft / sec   (d) 15 ft / sec.

13 | is
(a) - (2 + cot x) $^{-1}$ + c   (b)   - (2 + cot x) $^{-2}$ + c
(c) **(2 + cot x) $^{-1}$ + c**   (d) -2 (2 + cot x) $^{-1}$ + c

14 | The value of is
(a)   π/2   (b)   3 π / 4   (c) **5 π / 4**   (d)   5 π /2

15 | The area of the region bounded by the curve $y = 2x - x^2$ and the line y = x is
(a) 6 sq. units   (b) ½ sq. units   (c) **1/6 sq. units**   (d)   1/3 sq. units

16 | The solution of the differential equation is
(a) y = (x- 1) e ^{x} + c   (b) **xy = (x -1) e^x + c**
(c)   xy = (x+ 1) e^{-x} + c   (d) y = (x – 1) e $^{-x}$ + c

17	If a space vector makes angles 150° and 60° with the positive direction of X and Y axes then the angle made by the vector with the positive direction of Z-axis is (a) 60 ^{o} (b) 120 ^{o} (c) 30 ^{o} (d) **90°**
18	The equation of the plane passing through the origin and containing the lines whose direction cosines are proportional to 1, 2, 2 and 2, 1, −3 is (a) **8x - 7 y + 3z = 0** (b) 8x +7y +3z = 0 (c) 4x - 7y − 3z + 2 = 0 (d) 6x + 7y − 3z = 0
19	The maximum value of z = 10x + 6y subject to constraints x ≥ 0, y ≥ 0, x + y ≤ 12, 2x + y ≤ 20 is (a) 100 (b) **104** (c) 72 (d) 120
20	Suppose that five good pens and two defective ones have been mixed up. To find the defective ones, the pens are tested one-by-one, at random and without replacement. What is the probability that both the defective fuses are found in the first two tests? (a) **1/ 21** (b) 5/ 7 (c) 10 / 21 d) 3/ 7

CHEMISTRY

Multiple choice questions

1. Volume of 75% H_2SO_4 by weight (density=1.8 g/ml) required to prepare 1L of 0.5 M solution is

   (a) 36 ml (b)3.6 ml
   (c) 39 ml (d) 33 ml

2. A certain buffer solution contains equal concentrations of X^- and HX. If K_b for X^- is $!0^{-10}$, calculate pH of the buffer.

   (a) 4 (b) 10
   (c) 7 (d) 14

3. Reagents required for conversion of benzene to hexachlorobenzene are
   (a) excess Cl_2 , $AlCl_3$ (b) sunlight , excess Cl_2

   (c) excess Cl_2, $ZnCl_2$ (d) sunlight, $CaCl_2$

4. The compressibility factor for a real gas at high pressure is
(a) 1+RT/pb (b) 1
(c) 1+ pb/RT (d) 1- pb/RT

5. Two electrolytic cells containing $CuSO_4$ and $AgNO_3$ are connected in series. Current of 2 A was passed till 10.8 g of Ag got deposited. (At.wt. of Cu = 63, Ag = 108). The amount of Cu deposited in the same time will be
    (a) 6.3 g (b) 1.575 g
    (c) 10.8 g **(d) 3.15 g**

6. In a Lechlanche cell which of the following takes place:
    (a) Reduction of Zn^{2+} to Zn **(b) Reduction of Mn^{4+} to Mn^{3+}**
    (c) Reduction of Mn^{4+} to Mn^{2+} (d) Oxidation of Mn^{3+} to Mn^{4+}

7. Standard heat of formation of CH_4, CO_2 and $H_2O(g)$ are -76.2, -394.8 and -241.6 kJ/mol respectively. The amount of heat evolved on burning 1 m3 of CH4 measured at STP is
(a) 801 kJ (b) 36 kJ
(c) 36000 kJ (d) 954 kJ

8. Which of the following is **NOT** true about glucose:
(a) Reduces Fehling's solution **(b) Gives Schiff's test**
(c) Has aldehyde group (d) Reduces Tollen's reagent

9. The order of intermolecular forces in the following polymers is
(a) Nylon 6,6 < PVC < Polyethylene (b) Nylon 6,6 < Polyethylene < PVC
(c) PVC < Polyethylene < Nylon 6,6 (d) Polyethylene < PVC < Nylon 6,6

10. The rate of a reaction doubles when temperature changes from $27^O C$ to $37^O C$. The activation energy is
(a) 53.6 kJ mol^{-1} (b) 57.6 x 10 J mol^{-1}
(c) 53600 kJ mol^{-1} (d) 123.4 kJ mol^{-1}

11. Hall-Heroult process is used for the extraction of
(a) Ni **(b) Al**
(c) Fe (d) Cu

12. The equilibrium mixture for
$2 SO_2(g) + O_2 (g) \rightarrow 2SO_3(g)$

present in 1 litre vessel at $600^O C$ contains 0.50, 0.12 and 5.0 mole of SO_2, O_2 and SO_3 respectively. The Kp for the reaction is
(a) 22000 atm^{-1} (b) 833 atm^{-1}
(c) 11.6 atm $^{-1}$ (d) 0.114 atm^{-1}

13. As per IUPAC nomenclature ,the complex $[Co(NH_3)_2(H_2O)_4]Cl_3$

(a) Tetraaquadiaminecobalt(III)chloride (b) Tetraaquadiamminecobalt(III)chloride
(c) Diaminetetraaquacobalt(III)chloride **(d) Diamminetetraaquacobalt(III)chloride**

14. The solubility product (Ksp) of CuS , Ag_2S and HgS are $10^{-31}, 10^{-44}$ and 10^{-54} respectively. The order

of their solubility in water is
(a) $CuS<Ag_2S<HgS$ (b) $Ag_2S <HgS<CuS$

(c) $HgS< CuS<Ag_2S$ (d) $CuS< HgS <Ag_2S$

15. Which of these salts can be converted into alkyne by Kolbe's method?
(a) Sodium succinate **(b) Sodium maleate**
(c) Sodium formate (d) Sodium acetate
Numerical answer questions
16. If the plot of Rate vs Concentration of reactants is a line parallel to x-axis, the order of the
reaction is **0**
17. Vant Hoff's factor for Na_2SO_4 in very dilute solution is **3**

18. The covalency of Nitrogen in N_2O_5 is **4**

19. A 37% (w/w) HCl stock solution has density of 1.18 g/ml. The molecular weight of HCl is 36.5
g/mol. The volume of stock solution required to prepare 100 ml solution of 6M HCl is **50**
20. The total number of lone pair of electrons in melamine is **6**

Physics

1. A ball A is thrown upfrom the edge of cliff and it lands below on the ground. Another indentical ball B is thrown down from the cliff with the same velocity as that of A. If the velocity of the ball A just before hitting the ground is v_A and the velocity of B just before hitting the ground is v_B then

    (a) **$v_A = v_B$,** (b) $v_A > v_B$ (c) $v_A < v_B$ (d) nothing can be said about their velocities
2. Water drips from the nozzle of a shower onto the floor 2m below. The drops fall at regular intervals of time, the first drop striking the floor at the instant the fourth drop begins to fall. What is the location of the second drop from the floor? **8/9m**

3. Three vect , a are given. What is the value of 3C.(2A X B)? **540**
4. A person walks up a stalled 20m long escalator in 120s. When standing on the moving escalator he is carried up the same distance in 80 seconds. The time required to walk up the moving escalator is

(a)   24s   (b)   **48s**   (c)   72s   (d) 96s

5.   A passenger of mass 80Kg stands on the floor of an elevator. If the elevator moves up with an acceleration $2m/s^2$ then the normal reaction of the floor of the elevator on the man is (assume $g=10m/s^2$) is
(a) 800N (b) 640N   (c) **960N** (d) 160N

6.   A 10Kg monkey climbs up a massless rope that runs over a frictionless branch of a tree and back down to a 15Kg package on the ground. The magnitude of the least acceleration the monkey must have if it is to lift the package off the ground is
(a) $9.8m/s^2$ (b) $19.6m/s^2$ (c) **$4.9m/s^2$** (d) $2.45m/s^2$

7.   A worker wishes to pile a cone of sand onto a circular area of radius 2m. The coefficient of static coefficient of friction between each layer of sand along the slope and the sand beneath it is 0.7 then assuming no slip the greatest height that the pile of sand can have is
(a) 2m (b) **1.4m** (c) 1m (d) 0.7m

8.   A disc of mass 1kgslides along a circular path of radius 1m, on a frictionless table while attached to a hanging block of mass 10kg through a hole in the table. The speed that can keep the block at rest is (assume $g = 10m/s^2$)
(a) 1m/s (b) 5m/s   (c) **10m/s** (d) 20m/s

9.   A helicopter lifts a 70Kg diver from the sea by means of a cable 50m long. The acceleration of the diver is g/20. How much work is done on the diver by the force from the helicopter? (take g as $10m/s^2$) **1750J**

10. The force on a particle is directed along the x-axis and given by $F = 240[(x/5)^2 – 1]$. The work done by the force in moving the particle from x = 0 to x = 20 is
(a) 18.8kJ   (b) 19.8kJ   (c) **20.8kJ**   (d)21.8kJ

11. A 50Kg bungee cord jumper is on a cliff 50m high above a stream. The elastic bungee cord has a relaxed length of 40m. The feet of the bungee jumper stops 2m above the stream. Assume that the cord obeys Hooke's law the spring constant of the cord is (assume $g = 10m/s^2$)
(a) 250N/m   (b) 500N/m   (c) **750N/m**   (d) 1000N/m

12.   A 5kg block is dropped from a height of 20cm onto a spring of force constant 2000N/m. The distance moved by the block after coming in contact with the spring is
(a) 5cm (b) **10cm** (c)15cm   (d)20cm

13. An object is placed on top of a hemispherical mound of ice of radius 6m. The object is given a small push after which it starts sliding. The height above the ground when the object leaves the hemispherical   mound is
(a) 3m (b) 6m (c) 1m   (d) **4m**

14. A 4kg block is placed on a horizontal surface and is connected to a spring of force constant 800N/m. The spring is compressed and then released. After the spring attains the relaxed length the block travels over the surface for a distance 10m. If the coefficient of kinetic friction for the surface is 0.4 the heat generated is
(a) 100J (b) 120J   (c)140J   (d) **160J**

15.   The coordinates of three masses 1kg, 3kg and 6kg are (1,1), (3,3) and (6,6) respectively. The coordinate of the centre of mass is
(a) (2,2) (b) (3,3) (c) (4,4) (d) **(5,5)**

16. A rod strikes a stationary ball with an average force of 50N over a time of 10ms. If the ball has mass 0.2kg the speed of the ball after the impact is
(a) **2.5m/s**   (b) 5m/s   (c) 10m/s   (d) 20m/s

17. The angular position of a point on a rotating wheel is given by $\theta = 2t^2 + 4t +4$. The angular velocity of the point at t = 16s is
(a) 60rad/s   (b)64rad/s   (c) **68rad/s**   (d)72rad/s

18. A wheel of radius R is placed against a step of height h. If the mass of the wheel is 10kg then the horizontal force required to be applied to the axle to lift the wheel over the step assuming R = 2h is (take $g = 10m/s^2$)
(a)   **173N**   (b)   273N   (c)373N   (d) 473N

19. Air flows over the wing of an aircraft of area 50m^2 with a speed 150m/s and under the wing, also of the same area, with a speed 125m/s. If the density of air is 1.25kg/m^3 the upthrust on the wing is
    (a) 0.415MN   (b) 0.315MN (c) **0.215MN** (d) 0.115MN

20. A block of mass 5kg is attached to two identical springs on either side of it. The springs are attached to the walls. The spring constant of the springs is 25N/m. The frequency of oscillation of the mass, when displaced from the equilibrium, is
    (a) 2Hz   (b) 1Hz (c) **0.5Hz** (d) 0.25Hz

21. An acoustic burglar alarm has a source emitting waves of frequency 100Hz. When a stranger moves towards the alarm a beat frequency of 5Hz is detected. The speed of the stranger is (assume speed of sound as 330m/s)
    (a) 6.04Hz (b) 7.04Hz   (c) **8.04Hz**   (d)9.04Hz

22. 10 moles of an ideal gas expand adiabatically from an initial temperature 100K to a final temperature 200K. If C_V is the molar specific heat capacity of the gas at constant volume the work done by the gas is
    (a) 10C_V (b) 100C_V (c) **1000C_V**   (d) 10000C_V

23. The motor in a refrigerator has a power of 240W. The freezing chamber is at 290K and the outside air is at 320K. What is maximum amount of energy that can be extracted in 30min assuming that the refrigerator works as a Carnot cycle in reverse? **40500J**

24. Two small conducting balls of mass 50g and carrying a charge 10microcoulomb hang from a thread of length 50cm. The separation between the balls at any instant is (g =10m/s^2)
    (a) **1.2m**   (b) 1m (c) 0.8m (d) 0.6m

25. A thin non conducting rod of length 1m has a charge of 1C uniformly distributed over it. What is the electric field at a point on the perpendicular bisector of the rod 0.5m from the centre? **24.5 x 10^{9}V/m**

26. Charge is distributed uniformly throughout the volume of an infinitely long cylinder of radius R with a charge density ρ. The electric field at a distance r (< R) cm from the axis of the cylinder is

    (a) **ρ r/2ε_0** (b) ρ r/ε_0 (c) 2ρ r/ε_0 (d) ρ rε_0

27. A cylindrical capacitor has an internal radius r and external radius R. Half the stored electrical energy lies within a cylinder of radius

    (a) R+ r   (b) **(rR)$^{0.5}$**   (c) (R -r)   (d) (rR)

28. A wire L metres long is stretched to twice its length such that there is no change in the volume of the wire. If the wire earlier had a resistance R the new resistance of the wire is

    (a) R   (b) 2R (c) 3R   (d) **4R**

29. When a wire L metres long is turned into a circular coil the magnetic field at the centre for a current I is B. The wire is wound into n turns. If the same current passes through the coil what is the magnetic field at the centre of the coil? **100B**

30. Two long parallel wires of equal radius R are placed a distance r apart. If they carry equal currents in opposite directions then the inductance per unit length of the pair of wires is

    (a) **(μ_0/π)(ln(r − R)/r** (b) (μ_0/π)(ln(r + R)/r (c) (μ_0π)(ln(r − R)/r   (d) (μ_0/π)(ln(r)/(r+R)

31. The optical path length of a ray of light in vacuum is 2cm. The optical path length in a medium of refractive index 2 is

    (a) 1cm (b) **4cm** (c) 2cm (d) 0

32. A source and a screen are a distance 10cm apart. If the focal length of the lens is 2cm then two real images are formed for lens position separated by

    (a) 2.24cm (b) **4.48cm** (c) 6.72cm (d) 8.96cm

33. A glass lens is coated on one side with a thin film of magnesium fluoride whose refractive index is 1.38. if the refractive index of glass is 1.5 what is the least thickness that eliminates reflections at 550nm

    (a) 50nm (b) **100nm** (c)150nm (d)200nm

34. The wavelength associated with the cutoff frequency for a metal is 300nm. What is the maximum kinetic energy of electrons ejected from the metal surface by UV light of wavelength 250nm? **0.82eV**

35. A 1.00g sample of Samarium (Sm) emits alpha particles at a rate of 120 particles/s. The isotope responsible for the decay is Sm - 147 has a natural abundance in bulk samarium of 15%. The half life for the decay process is

    (a) 10^9 y (b) 10^{10} y (c) **10^{11} y** (d) 10^{12} y