JEE MAIN 2020

FULL TEST-8

CHEMISTRY , PHYSICS, MATHEMATICS

Time : - 3 Hours **Max. Marks:- 300** **Date : .....**

INSTRUCTIONS :

1. The test is of 3 hours duration.
2. The Test Booklet consists of 75 questions. The maximum marks are **300.**
3. There are three parts in the question paper A, B, C consisting of Chemistry, Physics and Mathematics having **25 questions** in each part of equal weightage. **20 questions** will be **MCQs** and **5 questions** will have answer to be filled as **numerical value**.
   Marking Scheme for MCQs
   Correct Answer Four mark (+4), Incorrect Answer Minus one mark (–1), Unanswered No mark (0)
   Marking Scheme for questions for which answer is a **Numerical value**
   Correct Answer Four mark (+4), Incorrect Answer No mark (0), Unanswered No mark (0)
4. There is only one correct response for each question. Filling up more than one response in each question will be treated as wrong response and marks for wrong response will be deducted accordingly.

Always desire to learn something **U**seful.

Wake up every morning with the thought that something **W**onderful is about to happen.

The difference between ordinary and e**X**traordinary is that little extra.

Name : .....

Address : .....

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Phone/Mobile No. .....

Roll No. .....

PART A – CHEMISTRY

SECTION - 1 (Q.1 - Q.20)

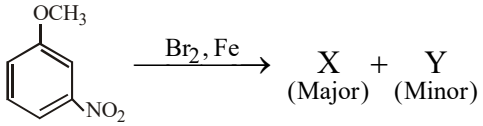
Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.1 Two oxides of a metal contains 50% and 40% of the metal respectively. The formula of the first oxide is MO. Then the formula of the second oxide is

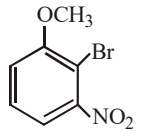
(1) MO_2 (2) M_2O_3

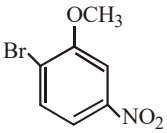
(3) M_2O (4) M_2O_5

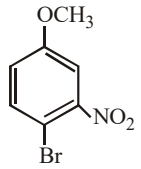
Q.2

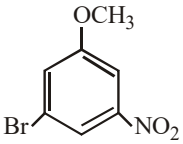


Identify X.

(1) 

(2) 

(3) 

(4) 

Q.3 Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy

(1) Vanadium (Z = 23) (2) Manganese (Z = 25)

(3) Chromium (Z = 24) (4) Iron (Z = 26)

Q.4 Ionic conductances of hydrated M^+ ions are in the order –

(1) $Li^+(aq) > Na^+(aq) > K^+(aq) > Rb^+(aq) > Cs^+(aq)$

(2) $Li^+(aq) > Na^+(aq) < K^+(aq) < Rb^+(aq) < Cs^+(aq)$

(3) $Li^+(aq) > Na^+(aq) > K^+(aq) > Rb^+(aq) < Cs^+(aq)$

(4) $Li^+(aq) < Na^+(aq) < K^+(aq) < Rb^+(aq) < Cs^+(aq)$

Q.5 Which of the following statements is correct?

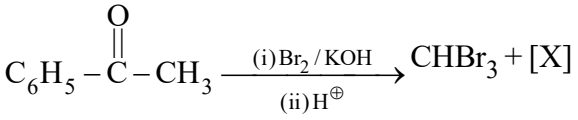
(1) BCl_3 and $AlCl_3$ are both Lewis acids and BCl_3 stronger than $AlCl_3$.

(2) BCl_3 and $AlCl_3$ both Lewis acids and $AlCl_3$ is stronger that BCl_3.

(3) BCl_3 and $AlCl_3$ are both equally strong Lewis acids.

(4) Both BCl_3 and $AlCl_3$ are not Lewis acids.

Q.6 In the given reaction :



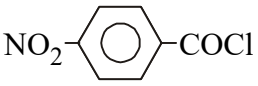
[X] will be:

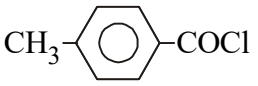
(1) C_6H_5–CHO (2) C_6H_5COOH

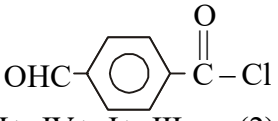
(3) C_6H_5–CH_2OH (4) CH_3COOH

Q.7 Arrange following compounds in decreasing order of reactivity for hydrolysis reaction :

(I) C_6H_5COCl

(II) 

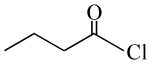
(III) 

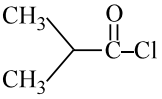
(IV) 

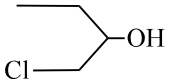
(1) II > IV > I > III (2) II > IV > III > I

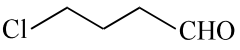
(3) I > II > III > IV (4) IV > III > II > I

Q.8 (X) $C_4H_7OCl \xrightarrow{NH_3} C_4H_9ON \xrightarrow[KOH]{Br_2}$ $CH_3CH_2CH_2NH_2$. Compound (X) is

(1) 

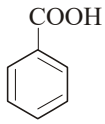
(2) 

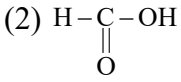
(3) 

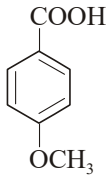
(4) 

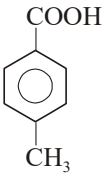
SPACE FOR ROUGH WORK

Q.9 Weakest acid amongst following is :

(1) 

(2) 

(3) 

(4) 

Q.10 Regarding the solution of I_2 which of the following is / are correct?

(i) I_2 solution in CCl_4 is violet in colour
(ii) I_2 solution in KI is brown in colour
(iii) I_2 solution in ether is brown in colour
(iv) I_2 solution in starch is deep red

(1) i, ii, iv (2) i, ii, iii
(3) ii, iii, iv (4) i, iii, iv

Q.11 Which one of the following is correct ?

(1) Schottky defect lowers the density.
(2) Frenkel defect increases the dielectric constant of the crystals.
(3) Stoichiometric defects make the crystals good electrical conductors.
(4) All the three.

Q.12 Pure benzene freezes at 5.45°C at a certain place but a 0.374m solution of tetrachloroethane in benzene freezes at 3.55°C. The K_f for benzene is-

(1) 5.08 K Kg mol^{-1} (2) 508 K Kg mol^{-1}
(3) 0.508 K Kg mol^{-1} (4) 50.8 °C Kg mol^{-1}

Q.13 How much will the potential of Zn / Zn^{2+} change if the solution of Zn^{2+} is diluted 10 times

(1) increase by 0.03V (2) decreases by 0.03 V
(3) increases by 0.059V (4) decreases by 0.059 V

Q.14 The rate constant is numerically the same for three reactions of first, second and third order respectively. Which one is true at a moment for rate of three reaction if concentration of reactants is same and greater than 1 M.

(1) $r_1 = r_2 = r_3$ (2) $r_1 > r_2 > r_3$
(3) $r_1 < r_2 < r_3$ (4) All

Q.15 On adding $AgNO_3$ solution into KI solution, a negatively charged colloidal sol is obtained when they are in

(1) 100mL of 0.1M $AgNO_3$+100 mL of 0.1 M KI
(2) 100mL of 0.1M $AgNO_3$ + 50 mL of 0.2 M KI
(3) 100mL of 0.1M $AgNO_3$ + 100 mL f 0.1 M KI
(4) 100mL of 0.1M $AgNO_3$+100mL of 0.15M KI

Q.16 The structure of XeF_6 is :

(1) Distorted octahedral (2) Pyramidal
(3) Tetrahedral (4) None of these

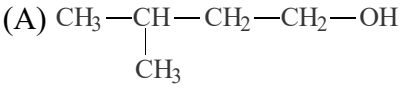
Q.17 Which of the following pair have almost similar size

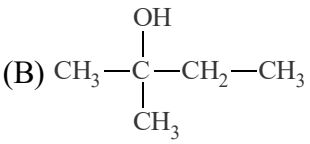
(1) Ti_{22} and Zr_{40} (2) Nb_{41} and Ta_{73}
(3) Y_{39} and La_{57} (4) Ca_{20} and Ir_{31}

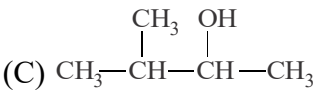
Q.18 Cu^{2+} and Cd^{2+} are distinguished through formation of complex $[Cu(CN)_4]^{2-}$ and $[Cd(CN)_4]^{2-}$ when H_2S gas is passed :

(1) There is yellow precipitate due to CdS.
(2) There is precipitation of CuS and CdS together.
(3) There is black precipitate due to CuS.
(4) There is blue precipitate due to CuS.

Q.19 Arrange the following alkanols A, B and C in order of their reactivity towards acid catalysed dehydration:

(A) 

(B) 

(C) 

(1) A > B > C (2) B > A > C
(3) B > C > A (4) C > B > A

Q.20 One mole of maltose gives two moles of D-glucose on hydrolysis. Both obtained unit are in –

(1) Furanose form (2) Pyranose form
(3) Both of these (4) None of these

SPACE FOR ROUGH WORK

SECTION - 2 (Q.21 - Q.25)

The answer to each question is a SINGLE DIGIT INTEGER ranging from 0 to 9, both inclusive.

Q.21 If K_p for the reaction $N_2O_4 \rightleftharpoons 2NO_2$ is 0.66 then the equilibrium pressure of N_2O_4 is $\left(\frac{1.68}{X}\right)$ atm.

Find the value of (X – 1).

(Total pressure at equilibrium is 0.5 atm)

Q.22 The pH of 4×10^{-3} M, $Y(OH)_2$ solution assuming the first dissociation to be 100% second dissociation to be 50% is (3.78 + X). Find the value of X.

Q.23 To determine soluble (free) SiO_2 in a rock, an alkaline extraction was carried out, as a result of which there was found 1.22% of SiO_2 in the extract and also 0.816 % of Al_2O_3. Considering that, apart from the free SiO_2, the extract also contained the SiO_2 that had passed into it from Kaolin ($2SiO_2.Al_2O_3$), the percentage of free SiO_2 in the rock being analysed is $\left(\frac{1.3}{X}\right)$ %. Find the value of X. (Si = 28, Al = 27)

Q.24 The heat evolved on combustion of 1 gm of starch, $(C_6H_{10}O_5)_x$, into $CO_2(g)$ and $H_2O(l)$ is 4.18 Kcal. The standard enthalpy of formation of 1 gm of starch is – (X + 0.41) Kcal. Find the value of X. Heat of formation of $CO_2(g)$ and $H_2O(l)$ are –94.05 and –68.32 Kcal/mol.

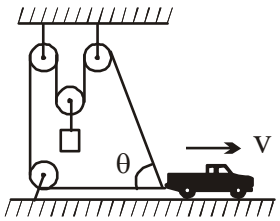
Q.25 The minimum number of carbon atoms in ketone to show metamerism :

PART B – PHYSICS

SECTION - 1 (Q.26 - Q.45)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

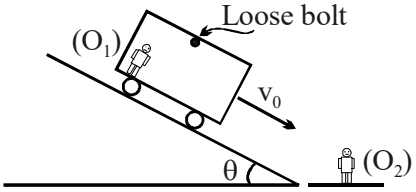
Q.26 In the figure shown, the speed of the truck is v to the right. The speed with which the block is moving up at θ = 60° is:



(1) v (2) 2v / 3

(3) 3v / 4 (4) none

Q.27 A cart is sliding on a smooth incline. An observer (O_1) is fixed to cart and another observer fixed on ground (O_2) observes , a loose bolt that is released from ceiling. At the instant of release cart has velocity v_0 as seen by O_2. Mark the correct option.



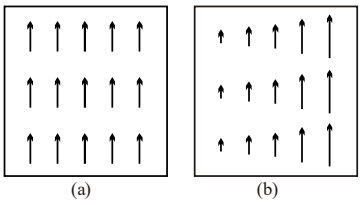
(1) Trajectory of bolt for O_1 is parabola.

(2) Trajectory of bolt for O_2 is straight line inclined at an angle θ with vertical.

(3) Trajectory of bolt for O_2 is a straight line perpendicular to ceiling of cart.

(4) Trajectory of bolt for O_1 is straight line.

Q.28 Figure shows force vectors at different points in space for two forces.



In figure (a) the force function is $\vec{F}_1 = F_0\hat{j}$, where F_0 is a constant. The force in figure (b) is given by $\vec{F}_2 = F_0\left(\frac{x}{a}\right)\hat{j}$, where origin is taken at left corner of the box, a is width of the each square box. Mark the correct options.

SPACE FOR ROUGH WORK

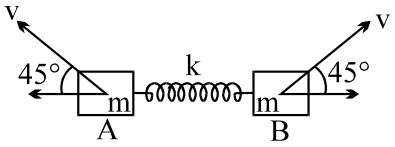
(1) Both forces $\vec{F}_1$ & $\vec{F}_2$ are conservative forces

(2) Both forces $\vec{F}_1$ & $\vec{F}_2$ are nonconservative forces.

(3) $\vec{F}_1$ is conservative $\vec{F}_2$ is non conservative.

(4) $\vec{F}_1$ is nonconservative $\vec{F}_2$ is conservative.

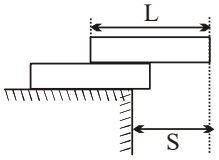
Q.29 Blocks A & B of mass m each are connected with spring of constant k. Both blocks lie on frictionless ground and are imparted horizontal velocity v as shown when spring is unstretched. Find the maximum stretch of spring.



(1) $v\sqrt{\frac{m}{k}}$ (2) $v\sqrt{\frac{m}{2k}}$

(3) $v\sqrt{\frac{2m}{k}}$ (4) none

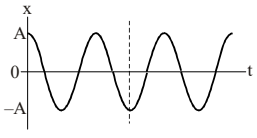
Q.30 Two identical bricks of length L are piled one on top of the other on a table as shown in the figure. The maximum distance S the top brick can overhang the table with the system still balanced is:



(1) (1/2) L (2) (2/3) L

(3) (3/4) L (4) (7/8) L

Q.31 This is the position graph of a mass on a spring. What can you say about the velocity and the force at the instant indicated by the dashed line ? Positive direction is to right.



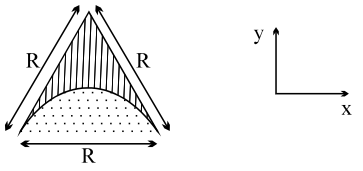
(1) Velocity is zero ; force is to the right.

(2) Velocity is positive ; force is to the right

(3) Velocity is negative ; force is to the right

(4) Velocity is zero ; force is to the left.

Q.32 A light, rigid sheet of triangular shape has a curved portion cut from it as shown in figure. It floats on the surface of water. Some soap solution is dropped over dotted region. Surface tension of water and soap film are T_1 & T_2 respectively. $T_1 = 1.5T_2$. Mark correct option.



(1) The frame experiences a net force $F = (T_1 - T_2)\,R$ in $y < 0$ direction

(2) The frame experiences force $F = (T_1 - T_2)\,R$ in $y > 0$ direction

(3) The frame experiences force $(T_1 - T_2)(2-\pi)R$ in $y > 0$ direction.

(4) Resultant force on wire frame is zero.

Q.33 The frequency of a car horn is f. What frequency is observed if both the car and the observer are at rest, but a wind is blowing from the car toward the observer ?

(1) f

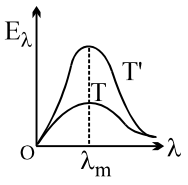
(2) greater than f

(3) less than f

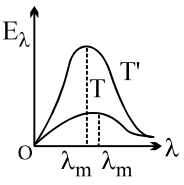
(4) either greater or less than f

Q.34 Identify the graph which correctly represents the spectral intensity versus wavelength graph at two temperatures T' and T (T < T')

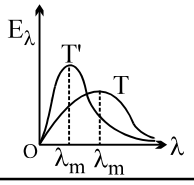
(1)



(2)



(3)

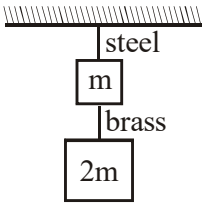


(4) none of these

SPACE FOR ROUGH WORK

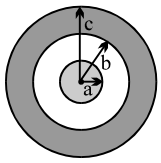
Q.35 The pressure and density of a gas ($\gamma = 1.5$) changes for (P, ρ) to (p', ρ') during adiabatic changes. If $\rho'/\rho = 32$, then P'/P will be
(1) 128 (2) 1/128
(3) 32 (4) None

Q.36 If the ratio of lengths, radii and Young's moduli of steel and brass wires in the figure are a,b and c respectively, then the corresponding ratio of increase in their lengths is

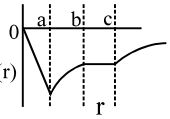


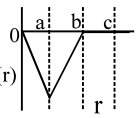
(1) $2a^2c/b$ (2) $3a/2b^2c$
(3) $2ac/b^2$ (4) $3c/2ab^2$

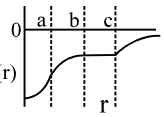
Q.37 A non-conducting sphere with radius a is concentric with and surrounded by a conducting spherical shell with inner radius b and outer radius c.

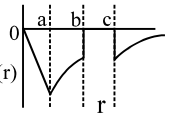


The inner sphere has a negative charge uniformly distributed throughout its volume, while the spherical shell has no net charge. The potential V(r) as a function of distance from the center is given by

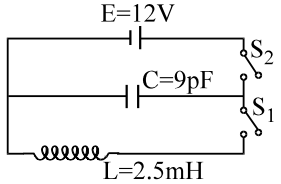
(1) 

(2) 

(3) 

(4) 

Q.38 In the circuit shown, the capacitor is initially charged with a 12 V battery, when switch S_1 is open and switch S_2 is closed. S_1 is then closed and, at the same time, S_2 is opened. The maximum value of current in the circuit is



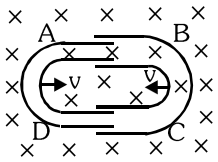
(1) 0.38 mA (2) 0.84 mA
(3) 0.72 mA (4) 0.1 mA

Q.39 In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows $P = a^3b^2/cd$. % error in P is –
(1) 4% (2) 14%
(3) 10% (4) 7%

Q.40 If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are
(1) [F V T^{-1}] (2) [F V T^{-2}]
(3) [F V^{-1} T^{-1}] (4) [F V^{-1} T]

Q.41 When 100 volts d.c. is applied across a solenoid a current of 1.0 amp. flows in it. When 100 volt a.c. is applied across the same coil, the current drops to 0.5 amp. If the frequency of the a.c. source is 50 Hz the impedance and inductance of the solenoid are :
(1) 200 ohm and 0.55 H (2) 100 ohm and 0.86 H
(3) 200 ohm and 1.0 H (4) 100 ohm and 0.93 H

Q.42 One conducting U tube can slide inside another as shown in figure, maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure. If each tube moves towards the other at a constant speed v, then the induced emf in the circuit, where ℓ is the width of each tube:-



(1) $2B\ell v$ (2) Zero
(3) $-B\ell v$ (4) $B\ell v$

Q.43 The amount of U^{235} to be fissioned, to operate 10kW nuclear reactor is (Approximately)
(1) 1.2×10^{-5} gm/s (2) 1.2×10^{-7} gm/s
(3) 1.2×10^{-9} gm/s (4) 1.2×10^{-13} gm/s

Q.44 The threshold wavelength of tungsten is 2300 Å. If ultra violet light of wavelength 1800 Å is incident on it, then the maximum kinetic energy of photo-electrons would be.
(1) 1.5 eV (2) 2.2 eV
(3) 3.0 eV (4) 5.0 eV

SPACE FOR ROUGH WORK

Q.45 Photon and electron are given same energy. The wavelength associated with it are λ_{ph} and λ_{el} respectively. Then which statement is true :

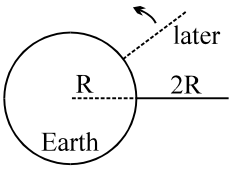
(1) $\lambda_{ph} > \lambda_{el}$ (2) $\lambda_{ph} < \lambda_{el}$

(3) $\lambda_{ph} = \lambda_{el}$ (4) $\frac{\lambda_{el}}{\lambda_{ph}} = C$

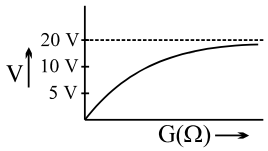
SECTION - 2 (Q.46 - Q.50)

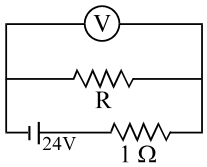
The answer to each question is a SINGLE DIGIT INTEGER ranging from 0 to 9, both inclusive.

Q.46 Consider a very long stick of length 2R, which extends from just above the surface of the earth, to a radius 3R. If initial conditions have been set up so that this stick moves in a circular orbit while always pointing radially. The period of this orbit. g represents acceleration due to gravity on surface of earth is $2\pi\sqrt{X}\sqrt{\frac{R}{g}}$. Find the value of X.



Q.47 A cell of internal resistance 1 Ω is connected across a resistor. A voltmeter having variable resistance G is used to measure p.d. across resistor. The plot of voltmeter reading V against G is shown. The value of external resistor R (in ohm) is



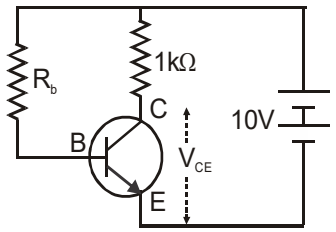


Q.48 A vessel is quarter filled with a liquid of refractive index μ. The remaining parts of the vessel is filled with an immiscible liquid of refractive index 3μ/2. The apparent depth of the vessel is 50% of the actual depth. The value of μ is (3 : X). Find the value of X.

Q.49 An electron of stationary hydrogen atom passes from the fifth energy level to the ground level. The velocity that the atom acquired a result of photon emission will be $\frac{24hR}{(5\times X)\ m}$. Find the value of X.

(m is the mass of the electron,
R = Rydberg constant and h = Planck's constant)

Q.50 In the circuit shown here the transistor used has current gain β = 100. The base resistor R_b is $(200\times 10^X)\ \Omega$. Find the value of X.
(so that $V_{CE} = 5V$, $V_{BE} = 0$)



PART C – MATHEMATICS

SECTION - 1 (Q.51 - Q.70)

Each question has FOUR options (1), (2), (3) and (4). ONLY ONE of these four options is correct.

Q.51 For every $x \in R$ the value of the expression $y = \frac{x^2}{8} + x\cos x + \cos 2x$ is never less than

(1) – 1 (2) 0

(3) 1 (4) 2

Q.52 If α, β are the roots of equation $x^2 + x - 2 = 0$, then the value of $\frac{\alpha\beta^4(\beta+1)^4 + \beta\alpha^4(\alpha+1)^4}{\alpha^2+\beta^2+\alpha+\beta}$ is equal to

(1) 2 (2) – 2

(3) 4 (4) – 4

SPACE FOR ROUGH WORK

Q.53 Let $a_n = 16, 4, 1, ...$ be a geometric sequence. Define P_n as the product of the first n terms. The value of $\sum_{n=1}^{\infty} \sqrt[n]{P_n}$

(1) 8 (2) 16
(3) 32 (4) 64

Q.54 In a jeep there are 3 seats in front and 3 in the back. Number of different ways can six persons of different heights be seated in the jeep, so that every one in front is shorter than the person directly behind is

(1) 90 (2) 360
(3) 540 (4) 15

Q.55 The range of the function, $f(x) = \cot^{-1}x + \sec^{-1}x + \operatorname{cosec}^{-1}x$, is

(1) $\left(\frac{\pi}{2}, \frac{3\pi}{2}\right)$ (2) $\left(\frac{\pi}{2}, \frac{3\pi}{4}\right] \cup \left[\frac{5\pi}{4}, \frac{3\pi}{2}\right)$

(3) $\left[\frac{\pi}{2}, \pi\right) \cup \left(\pi, \frac{3\pi}{2}\right]$ (4) $\left(\frac{\pi}{2}, \pi\right) \cup \left(\pi, \frac{3\pi}{2}\right)$

Q.56 If $f(x) = \begin{cases} 3\left(1+|\tan x|\right)^{\frac{\alpha}{|\tan x|}}; & \frac{-1}{2} < x < 0 \\ \beta \qquad\qquad\quad ; & x = 0 \\ 3\left(1+\left|\frac{\sin x}{3}\right|\right)^{\frac{6}{|\sin x|}}; & 0 < x < \frac{2}{3} \end{cases}$

is a continuous function at $x = 0$, then the ordered pair (α, β) is equal to

(1) $(2, e^2)$ (2) $\left(2, \frac{2}{e^2}\right)$

(3) $(2, 3e^2)$ (4) $\left(2, \frac{3}{e^2}\right)$

Q.57 Let $a = \min [x^2 + 2x + 3, \ x \in R]$ and $b = \lim_{x\to 0} \frac{\sin x \cos x}{e^x - e^{-x}}$. Then the value of $\sum_{r=0}^{n} a^r b^{n-r}$ is

(1) $\frac{2^{n+1}+1}{3\cdot 2^n}$ (2) $\frac{2^{n+1}-1}{3\cdot 2^n}$

(3) $\frac{2^n-1}{3\cdot 2^n}$ (4) $\frac{4^{n+1}-1}{3\cdot 2^n}$

Q.58 A function f(x) satisfies $f(x) = \sin x + \int_0^x f'(t)(2\sin t - \sin^2 t)\,dt$ then f(x) is

(1) $\frac{x}{1-\sin x}$ (2) $\frac{\sin x}{1-\sin x}$

(3) $\frac{1-\cos x}{\cos x}$ (4) $\frac{\tan x}{1-\sin x}$

Q.59 Let $f(x) = \left(\frac{a^2-4}{a^2+2}\right)x^3 - 3x + \sin 3$, then the true set of values of a for which f(x) is strictly decreasing on R, is

(1) $(-\infty, -2)$ (2) $[2, \infty)$
(3) $[-2, 2]$ (4) $(5, \infty)$

Q.60 If A and B are different matrices satisfying $A^3 = B^3$ and $A^2B = B^2A$, then

(1) det $(A^2 + B^2)$ must be zero.
(2) det $(A - B)$ must be zero.
(3) det(A^2+B^2) as well as det$(A-B)$ must be zero.
(4) At least one of det $(A^2 + B^2)$ or det $(A - B)$ must be zero.

Q.61 A box contains 5 radio tubes of which 2 are defective. The tubes are tested one after the other until the 2 defective tubes are discovered. The probability that the process stopped on the third test, is

(1) 3/10 (2) 2/10
(3) 1/10 (4) none

Q.62 A region in the xy plane is bounded by the graph of $y = 1/x$, the x-axis, the line $x = m$, and the line $x = 2m$, $m > 0$. The area of this region

(1) is independent of m
(2) increases as m increases
(3) decreases as m increases
(4) decreases as m increases when $m < 1/2$ and increases as m increases when $m > 1/2$.

SPACE FOR ROUGH WORK

Q.63 The normal chord of a parabola $y^2 = 4ax$ at the point whose ordinate is equal to the abscissa, then angle subtended by normal chord at the focus is :

(1) $\pi/4$ (2) $\tan^{-1}\sqrt{2}$

(3) $\tan^{-1} 2$ (4) $\pi/2$

Q.64 Let R and S be two non-void relations on a set A. Which of the following statements is false?

(1) R and S are transitive implies $R \cap S$ is transitive.

(2) R and S are transitive implies $R \cup S$ is transitive.

(3) R & S are symmetric implies $R \cup S$ is symmetric.

(4) R and S are reflexive implies $R \cup S$ is reflexive.

Q.65 $\sim (p \Rightarrow q) \Leftrightarrow \sim p \vee \sim q$ is

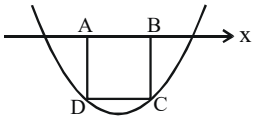
(1) a tautology

(2) a contradiction

(3) neither a tautology nor a contradiction

(4) cannot come to any conclusion

Q.66 If graph of the expression $y = x^2 - 8x + 12$ is shown in the figure then area of the square ABCD inscribed between parabola & x-axis is given by



(1) $12 + 4\sqrt{5}$ (2) $12 - 4\sqrt{5}$

(3) $24 + 8\sqrt{5}$ (4) $24 - 8\sqrt{5}$

Q.67 Let $f(x) = \cos(\pi(|x| + 2[x]))$ where [.] represents greatest integer function, then -

(1) f(x) is neither odd nor even

(2) f(x) is non periodic function

(3) Range of f(x) is [–1, 1]

(4) $f(x) = |f(x)|$ for all x.

Q.68 Maximum length of chord of the ellipse $\frac{x^2}{8} + \frac{y^2}{4} = 1$, such that eccentric angles of its extremities differ by $\pi/2$ is -

(1) 4 (2) $2\sqrt{2}$

(3) 16 (4) 8

Q.69 If $\vec{a}$ and $\vec{b}$ are perpendicular unit vectors and vector $\vec{c}$ is such that $\vec{c} = \vec{a} + \vec{b}$, then $(\vec{a} \times \vec{b}).(\vec{b} \times \vec{c}) + (\vec{b} \times \vec{c}).(\vec{c} \times \vec{a}) + (\vec{c} \times \vec{a}).(\vec{a} \times \vec{b})$ is -

(1) 0 (2) 1

(3) –1 (4) $\vec{b}.\vec{c} + \vec{c}.\vec{a}$

Q.70 Plane passing through points A(1,0,1), B(3,2,–1) and parallel to y-axis meets line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-5}{3}$ at point -

(1) (0,0,2) (2) (1,2,5)

(3) (0,0,0) (4) (2,4,8)

SECTION - 2 (Q.71 - Q.75)

The answer to each question is a SINGLE DIGIT INTEGER ranging from 0 to 9, both inclusive.

Q.71 The locus of the point of intersection of the tangent to the circle $x^2 + y^2 = a^2$, which include an angle of 45° is the curve $(x^2 + y^2)^2 = \lambda a^2 (x^2 + y^2 - a^2)$. The value of λ is

Q.72 If the function $f(x) = x^3 + e^{x/2}$ and $g(x) = f^{-1}(x)$; then the value of g'(1) is :

Q.73 If $\lim_{n\to\infty} \frac{(1^2 + 2^2 + ... + n^2)(1^4 + 2^4 + ... + n^4)}{(1^7 + 2^7 + ... + n^7)} = \frac{K+1}{15}$; then K is equal to

Q.74 If the vertex of the conic represented by $25(x^2 + y^2) = (3x - 4y + 12)^2$ is $\left(-\frac{6\lambda}{25}, \frac{6\mu}{25}\right)$, then $(\lambda + \mu)$ is-

Q.75 If $z_n = a_n + i\, b_n$ (n = 1, 2, 3,....., 11) are the roots of the equation $z^{11} + 2z^{10} + 3z^9 + 4z^8 + 5z^7 + 6z^6 + 5z^5 + 4z^4 + 3z^3 + 2z^2 + z = 0$ then find the value of $\sum_{n=1}^{11} |a_n|$.

SPACE FOR ROUGH WORK