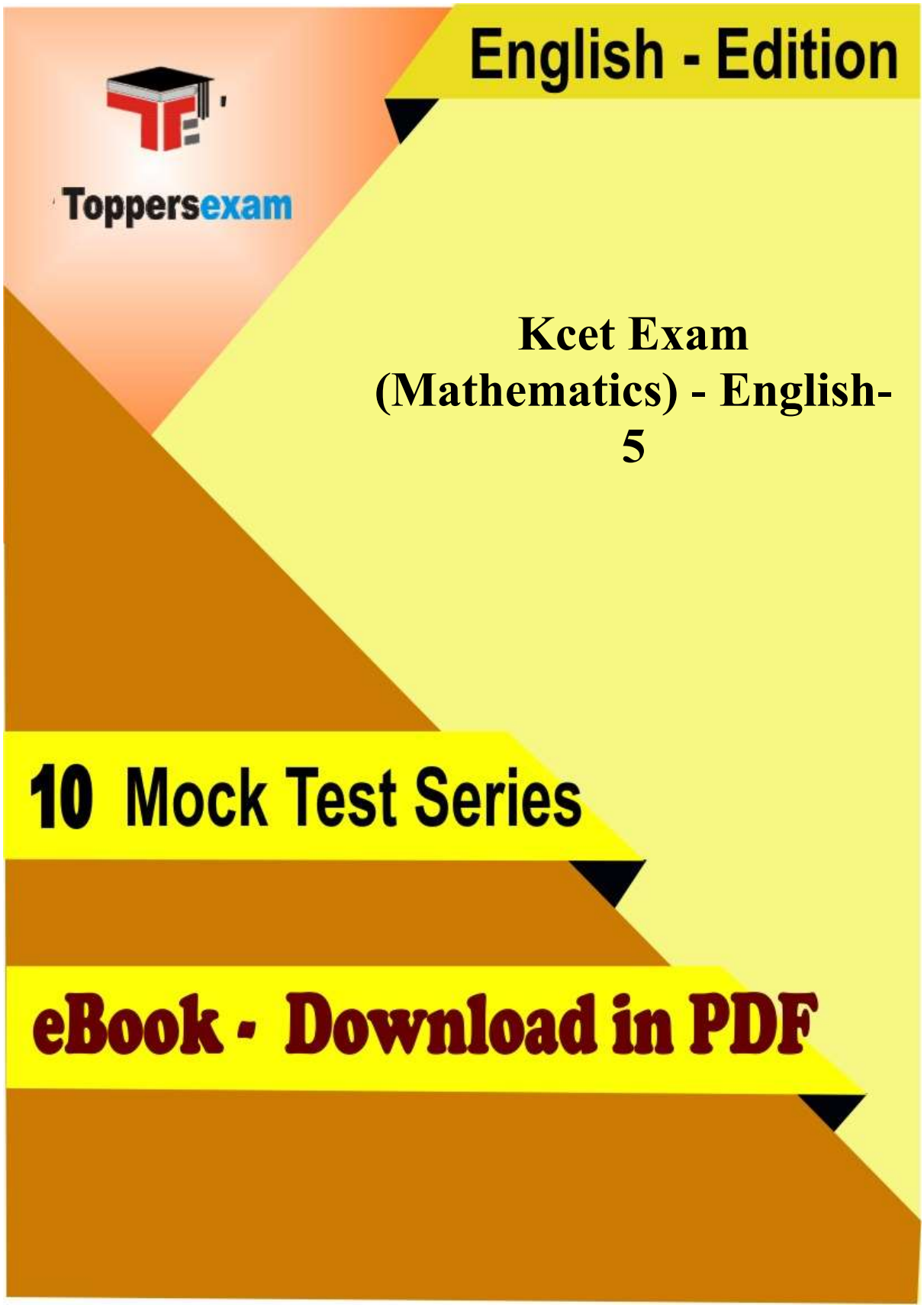

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Kcet Exam (Mathematics) - English-5

Paper Questions

SUBJECT: Physics

Question 1 : Myopia is corrected by :

(A) cylindrical lens

(B) bifocal lens

(C) concave lens

(D) convex lens

Correct Answer: C

Question 2 : The resistance of an ideal ammeter will be :

(A) zero

(B) small

(C) very high

(D) infinite

Correct Answer: A

Question 3 : The energy that should be added to an electron, to reduce its de-Broglie wavelengths from 10^{-10} m to 0.5 x 10^{-10} m, will be :

(A) four times the initial energy

(B) thrice the initial energy

(C) equal to the initial energy

(D) twice the initial energy

Correct Answer: A

Question 4 : For which of the following combination of working temperatures, the efficiency of Carnot's engines is highest ?

(A) 100 K, 80 K

(B) 80 K, 60 K

(C) 60 K, 40 K

(D) 40 K, 20 K

Correct Answer: D

Question 5 : The magnetic flux linked with a coil, in webers, is given by the equations $Ø = 3t^2 + 4t + 9$. Then the magnitude of induced emf at t=2 second will be :

(A) 2 volt

(B) 4 volt

(C) 8 volt

(D) 16 volt

Correct Answer: D

Question 6 : A box is lying on an inclined plane what is the coefficient of static friction if the box

starts sliding when an angle of inclination is 60º :

(A) 1.173

(B) 1.732

(C) 2.732

(D) 1.677

Correct Answer: B

Question 7 : Transverse waves can propagate in :

(A) liquids

(B) solids

(C) gases

(D) none of these

Correct Answer: B

Question 8 : A chimpanzee swinging on a swing in a sitting position, stands up suddenly, the time period will :

(A) become infinite

(B) remain same

(C) increase

(D) decrease

Correct Answer: D

Question 9 : An example of a diamagnetic substance is : -

(A) aluminium

(B) copper

(C) iron

(D) nickel

Correct Answer: B

Question 10 : In a charged capacitor, the energy is stored in :

(A) centre of the plates

(B) edges of the plates

(C) between the plates

(D) none of these

Correct Answer: B

Question 11 : Relative permeability of iron is 5500, then its magnetic susceptibility will be :

(A) 5500×10^{7}

(B) 5500×10^{-7}

(C) 5501

(D) 5499

Correct Answer: D

Question 12 : On increasing the temperature of a substance gradually, Which of the following colours will be noticed by you :

(A) white

(B) yellow

(C) green

(D) red

Correct Answer: D

Question 13 : The relation between n_1 and n_2, if behavior of light rays is as shown in figure is :

(A) $n_1 >> n_2$

(B) $n_2 >> n_1$

(C) $n_1 > n_2$

(D) $n_1 = n_2$

Correct Answer: B

Question 14 : Two resistances r_1 and r_2 ($r_1 < r_2$) are connected in parallel. The equivalent resistance R is such that :

(A) $R > (r_1 + r_2)$

(B) $r_2 < R < (r_1 + r_2)$

(C) $r_1 < R < r_2$

(D) $R < r_1$

Correct Answer: D

Question 15 : The potential at a point, due to a positive charge of 100 μC at a distance of 9 m, is :

(A) 10^7 volt

(B) 10^6 volt

(C) 10^5 volt

(D) 10^4 Volt

Correct Answer: C

Question 16 : Four Wires of identical length, diameters and of the same material are stretched on a sonometre wire. If the ratio of their tensions is 1 : 4 : 9 : 16 then the ratio of their fundamental frequencies are :

(A) 16 : 9 : 4 : 1

(B) 4 : 3 : 2 : 1

(C) 1 : 4 : 2 :16

(D) 1 : 2 : 3 : 4

Correct Answer: D

Question 17 : An echo is heard when the minimum distance of the reflecting surface is :

(A) 47 m

(B) 34 m

(C) 17 m

(D) 9 m

Correct Answer: C

Question 18 : In which process the P-V indicator diagram is a straight line parallel to volume axis ?

(A) irreversible

(B) adiabatic

(C) isothermal

(D) isobaric

Correct Answer: D

Question 19 : The kinetic energy of a body becomes four times its initial value. Then the linear momentum will be :

(A) four times the initial value

(B) three times the initial value

(C) twice the initial value

(D) same as the initial value

Correct Answer: C

Question 20 : At which temperature, the Fahrenheit and Centigrade scales are equal :

(A) - 48°

(B) - 40°

(C) 37°

(D) 40°

Correct Answer: B

Question 21 : The resistance of a conductor is 5 ohm at 50°C and 6 ohm at 100°C. Its resistahce at 0°C is :

(A) 1 ohm

(B) 2 ohm

(C) 3 ohm

(D) 4 ohm

Correct Answer: D

Question 22 : The impurity atom that should be added the germanium to make it *n* type will be :

(A) aluminium

(B) arsenic

(C) indium

(D) iodine

Correct Answer: C

Question 23 : The waves that can not be polarised are :

(A) electromagnetic Waves

(B) longitudinal waves

(C) transverse waves

(D) light waves

Correct Answer: B

Question 24 : An empty vessel is partially filled with water, then the frequency of vibration of air column in the vessel :

(A) remains same

(B) decreases

(C) increases

(D) first increases then decreases

Correct Answer: C

Question 25 : A man suffering from short sight is unable to see objects distinctly at a distance more than 2m. The power of lens required to correct this defect of the eye should be :

(A) + 2D

(B) 0.50 D

(C) – 2D

(D) – 0.5 D

Correct Answer: D

Question 26 : A monoatomic gas is suddenly compressed to 1/8th of its initial volume adiabatically. The ratio of its final pressure to initial pressure will be (γ=5/3) :

(A) 8

(B) 24

(C) 32

(D) 40

Correct Answer: C

Question 27 : 2 kg mass is rotating on a circular path of radius 0.8 m with an angular velocity of 44 rad / sec. If the radius of the path becomes 1 m. Then value of angular velocity is :

(A) 35.32 rad / sec

(B) 28.16 rad / sec

(C) 14.08 rad / sec

(D) 7 rad / sec

Correct Answer: B

Question 28 : A Whistle of frequency 500 Hz tied to the end of a string of length 1.2 m revolves at 400 rev / min. A listener standing some distance away in the plane of rotation of Whistle nears frequencies in the rays (speed of sound = 340 m / s) :

(A) 436 to 586

(B) 426 to 574

(C) 436 to 574

(D) 436 to 574

Correct Answer: A

Question 29 : The dispersive powers of crown and flint glasses are 0.02 and 0.04 respectively. In an achromatic combination of lenses the focal length of flint glass lens is 40 cm. The focal length of crown glass lens will be :

(A) - 20 cm

(B) + 20 cm

(C) - 10 cm

(D) + 20 cm

Correct Answer: B

Question 30 : Two insulated metallic spheres of capacitances 3 µF and 5 µF are charged to 300 volts and 500 volts respectively. The energy loss when they are connected by a wire is :

(A) 0.035 *J*

(B) 1.5 *J*

(C) 3.751 *J*

(D) 0.0375 *J*

Correct Answer: D

Question 31 : The gardener waters the plants bt a pipe of diameter 1 mm. The water comes out at a rate of 10 cm^3/ sec. The reactionary force exerted on the hand of the gardener is :

(A) zero

(B) 1.27 x 10^{-2} N

(C) 1.27 x 10^{-4} N

(D) 0.127 N

Correct Answer: D

Question 32 : A thin hollow cylinder open at both ends :
(i) sliding without rotating
(ii) rolls without slipping, with the same speed the ratio of kinetic energy in the two cases is :

(A) 1 : 1 : 1

(B) 4 : 1 : 1

(C) 1 : 2

(D) 2 : 1

Correct Answer: C

Question 33 : A rain drop of radius 0.3 mm has a terminal velocity of 1 m / s in air. The viscosity of air is 18×10^{-5} poise. The visious forces on the drop will be :

(A) 16.95×10^{-9} N

(B) 1.695×10^{-9} N

(C) 10.17×10^{-9} N

(D) 101.73×10^{-9} N

Correct Answer: D

Question 34 : The force required to separate two glass plates of area 10^{-2} m^2 with a film of water 0.05 mm thick between them, is (Surface tension of water is 70×10^{-3} N/m)

(A) 28 N

(B) 14 N

(C) 50 N

(D) 38 N

Correct Answer: A

Question 35 : The Younge's double slit experiment, the separation between the slits is halved and the distance between slits and screen is doubled. The fringes width will :

(A) remain the same

(B) be quadrupled

(C) be doubled

(D) be halved

Correct Answer: B

Question 36 : If the energy released in the fission of one nucleus is 200 MeV. Then the number of nuclei required per second in a power plant of 16 kW will be :

(A) $0.5 \ \ 10^{14}$

(B) $0.5 \ \ 10^{12}$

(C) $5 \ \ 10^{12}$

(D) $5 \ \ 10^{14}$

Correct Answer: D

Question 37 : A student is standing at a distance of 50 meter from the bus. as soon as the bus begins

the motion with an acceleration of 1 ms^{-2}, the student starts running towards the bus with a uniform velocity u Assuming the motion to be along a straight road, the minimum value of u, so that the student is able to catch the bus is:

(A) 8 ms^{-1}

(B) 5 ms^{-1}

(C) 12 ms^{-1}

(D) 10 ms^{-1}

Correct Answer: D

Question 38 : After an interval of one day 1 / 6th of the initial amount of a radioactive material remains in a sample. Its half life will be :

(A) 2 hour

(B) 3 hour

(C) 6 hour

(D) 12 hour

Correct Answer: C

Question 39 : Weight of a body of mass m decreases by 1% when it is raised to height h above the earth's surface. If the body is taken to a depth h in a mine, change in its weight is:

(A) 0.5% decrease

(B) 2% decrease

(C) 0.5% increase

(D) 1% increase

Correct Answer: A

Question 40 : Relative permeability of iron is 5500, then its magnetic susceptibility will be :

(A) 5500×10^{7}

(B) 5500×10^{-7}

(C) 5501

(D) 5499

Correct Answer: D

Question 41 : Which of the following sets of concurrent forces may be in equilibrium?

(A) F_1=3N, F_2=5N, F_3=1N

(B) F_1=3N, F_2=5N, F_3=9N

(C) F_1=3N, F_2=5N, F_1=6N

(D) F_1=3N, F_2=5N, F_3=15N

Correct Answer: C

Question 42 : Young's modules of perfectly rigid body material is:

(A) infinite

(B) zero

(C) 10×10^{10} N/m^2

(D) $1x10^{10}$ N/m^2

Correct Answer: A

Question 43 : An ideal monoatomic gas at 27^0 C is compressed adiabatically to 8/27 times of its present volume. The increases in temperature of the gas is:

(A) 375^0 C

(B) 402^0 C

(C) 175^0 C

(D) 475^0 C

Correct Answer: A

Question 44 : In a charged capacitor, the energy is stored in :

(A) centre of the plates

(B) edges of the plates

(C) between the plates

(D) none of these

Correct Answer: B

Question 45 : A bucket full of hot water is kept in a room. It cools from 75^0 C to 70^0 C in t_1 minutes, from 70^0 C to 65^0 C in t_2 minutes and from 65^0 C to 60^0 C in t_3 minutes, Then:

(A) $t_1 < t_2 < t_3$

(B) $t_1 = t_2 = t_3$

(C) $t_1 < t_2 > t_3$

(D) $t_1 > t_2 > t_3$

Correct Answer: A

Question 46 : The energy that should be added to an electron, to reduce its de-Broglie wavelengths from 10^{-10} m to 0.5 10^{-10} m, will be :

(A) four times the initial energy

(B) thrice the initial energy

(C) equal to the initial energy

(D) twice the initial energy

Correct Answer: A

Question 47 : The aperture of the objective lens of a telescope is made large so as to:

(A) increase the resolving power of the

(B) increase the magnifying power of the telescope

(C) to focus on distant objects

(D) make image aberrationless

Correct Answer: A

Question 48 : A lamp hanging 4 metres above the table is lowered by 1 metre. The illumination on

the table:

(A) decreased by 25%

(B) increased by 25%

(C) decreased by 66.7%

(D) increased by 77.7%

Correct Answer: D

Question 49 : If V_m is the velocity of sound in moist air, V_d is the velocity of sound in dry air, under identical conditions of pressure and temperature:

(A) $V_m < V_d$

(B) $V_m > V_d$

(C) $V_m V_d = 1$

(D) $V_m = V_d$

Correct Answer: B

Question 50 : The resistance of an ideal ammeter will be :

(A) zero

(B) small

(C) very high

(D) infinite

Correct Answer: A

Question 51 : Two wires are fixed in a sonometer. Their tensions are in the ratio 8:1. The lengths are in the ratio 36:35. The diameters are in the ratio 4:1. Densities of the materials are in the ratio 1:2. If the higher frequency in the setting is 360Hz, the beat frequency when the two wires are sounded together, is:

(A) 8

(B) 5

(C) 10

(D) 6

Correct Answer: C

Question 52 : Diffraction effects are easier to notice in the case of sound waves than in case of light waves, because the sound waves are :

(A) of longer wavelengths

(B) of shorter wavelengths

(C) longitudinal waves

(D) mechanical Waves

Correct Answer: A

Question 53 : Light is incident on a glass plate at an angle 600, the reflected and refracted rays are mutually perpendicular to each other, then the refractive index of plate will be :

(A) 1.732

(B) 1.5

(C) 1.4

(D) 1.5

Correct Answer: A

Question 54 : Cavitation is a special application property exhibited only by:

(A) ultrasonics

(B) electromagnetic waves

(C) audible sound

(D) infrasonics

Correct Answer: A

Question 55 : If in a Wire of Young's modulus Y, longitudinal strain X is produced, then the value of potential energy stored in its unit volume will be

(A) $0.5YX^2$

(B) $0.5Y^2X$

(C) $2YX^2$

(D) YX^2

Correct Answer: A

Question 56 : Yellow light is used in single slit diffraction experiment with slit width 0.6 mm. if yellow light is replaced by X-rays, then the pattern will reveal that:

(A) no diffraction pattern

(B) that the central maxima narrower

(C) less number of fringes

(D) more number of fringes

Correct Answer: A

Question 57 : In an interference experiment, third bright fringe is obtained at a point on the screen with a light of 700 nm. What should be the wavelength of the light source in order to obtain 5^{th} bright fringe at the same point?

(A) 630 nm

(B) 500 nm

(C) 420 nm

(D) 750 nm

Correct Answer: C

Question 58 : If a ray of light in a denser medium i, the angle of reflection and refraction are respectively r and r'. If the reflected and refracted rays are at right angles to each other, the critical angle for the given pair of media is:

(A) $\sin^{-1}(\tan r')$

(B) $\sin^{-1}(\tan r)$

(C) $\tan^{-1}(\sin i)$

(D) cot (tan i)

Correct Answer: B

Question 59 : Waves that cannot be polarized are:

(A) electromagnetic waves

(B) light waves

(C) longitudinal waves

(D) transverse waves

Correct Answer: C

Question 60 : The phenomenon of rotation of plane of plane polarized light is called:

(A) Kerr effect

(B) Double refraction

(C) optical activity

(D) dichroism

Correct Answer: C

SUBJECT: Chemistry

Question 61 : The temperature of the slag zone in the metallurgy of iron using blast furnace is

(A) 1200-1500^{o}C

(B) 1500-1600^{o}C

(C) 400-700^{o}C

(D) 800-1000^{o}C

Correct Answer: D

Question 62 : When 9.65 coulombs of electicity is passed through a solution of silver nitrate (atomic mass of Ag = 108 g mol^{-1}), the amount of silver deposited is :

(A) 16.2 mg

(B) 21.2 mg

(C) 10.8 mg

(D) 6.4 mg

Correct Answer: C

Question 63 : The order of stability of metal oxides is

(A) $Al_2O_3<MgO<Fe_2O_3<Cr_2O_3$

(B) $Cr_2O_3<MgO<Al_2O_3<Fe_2O_3$

(C) $Fe_2O_3<Cr_2O_3<Al_2O_3<MgO$

(D) $Fe_2O_3<Al_2O_3<Cr_2O_3<MgO$

Correct Answer: C

Question 64 : Bleachirig powder loses its power on for a long time because :

(A) it changes into calcium hypochlorate

(B) it changes into calcium chloride and calcium hydroxide

(C) it absorbs moisture

(D) it changes into calcium chloride and calcium chlorate

Correct Answer: D

Question 65 : When potassium ferrocyanide crystals are heated with concentrated sulphuric acid, the gas evolved is :

(A) sulphur dioxide

(B) ammonia

(C) carbon dioxide

(D) carbon monoxide

Correct Answer: D

Question 66 : $H^2 + Cl^2 \rightarrow 2\ HCl$, $\Delta H = 194$ kJ. In this Reaction heat of formation of HCl in kJ is :

(A) +914 kJ

(B) +97 kJ

(C) -97 kJ

(D) -194 kJ

Correct Answer: B

Question 67 : One mole of an ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. If the work done during the process is 3 kJ, the final temperature will be equal to ($C\theta = 20\ J\ K^{-1}$) p

(A) 150 K

(B) 100 K

(C) 26.85°C

(D) 295 K

Correct Answer: A

Question 68 : Solution of sodium metal in liquid ammonia is strongly reducing due to the presence in the solution of the following :

(A) sodium hydride

(B) sodium amide

(C) sodium atoms

(D) solvated electrons

Correct Answer: D

Question 69 : Which of the following has lowest percentage of carbon ?

(A) steel

(B) all have same percentage

(C) cast ion

(D) wrought iron

Correct Answer: D

Question 70 : When ethanal is heated with Fehling's solution it gives a precipitate of :

(A) CuO

(B) Cu^2O + CuO

(C) Cu

(D) Cu^2O

Correct Answer: D

Question 71 : The number of unpaired electrons in Fe^{3+} (Z = 26) are :

(A) 5

(B) 6

(C) 3

(D) 4

Correct Answer: A

Question 72 : The *pKa* of a certain Weak acid is 4.0. What should be the [salt] to [acid] ratio if we have to prepare a buffer with pH=5 using the acid and one of the salts ?

(A) 10 : 1

(B) 1 : 10

(C) 4 : 5

(D) 5 : 4

Correct Answer: A

Question 73 : Which one of the following contains both covalent and ionic bonds ?

(A) NH^4Cl

(B) H^2O

(C) CCl^4

(D) $CaCl^2$

Correct Answer: A

Question 74 : The nitride ion tin lithium composed of :

(A) 7 protons + 10 electrons

(B) 10 protons + 10 electrons

(C) 7 protons + 7 protons

(D) 10 protons + 7 electrons

Correct Answer: A

Question 75 : In a face centred cubic cell, an atom at the face contributes to the unit cell :

(A) 1 /4 part

(B) 1 /8 part

(C) 1 part

(D) 1 /2 part

Correct Answer: D

Question 76 : Unpleasent smelling carbylamines are formed by heating alkai and chloroform with :

(A) Any aliphatic amine

(B) Any aromatic amine

(C) Any amine

(D) any primary amine

Correct Answer: D

Question 77 : Which of the following alkyl halides Is used as a methylating agent ?

(A) C^2H^5Br

(B) C^6H^5Cl

(C) Ch^3Cl

(D) C^2H^5Cl

Correct Answer: C

Question 78 : A radioactive isotope having a half life of 3 days was received after 12 days. It was found that there were 3 g of the isotope in the container. The initial weight of the isotope when packed was :

(A) 36 g

(B) 48 g

(C) 12 g

(D) 24 g

Correct Answer: B

Question 79 : Cuprous ion is colourless while cupric ion is coloured because :

(A) both have half filled *p* and *d*-orbitals

(B) cuprous ion has incomplete *d*-orbital and cupric ion has a complete *d*-orbital

(C) both have unpaired electrons in the *d*-orbitals

(D) cuprous ion has a complete *d*-orbital and cupric ion has an incomplete *d*-orbital

Correct Answer: D

Question 80 : Which of the following ions can cause coagulation of proteins ?

(A) Ag^{+}

(B) Na^{+}

(C) Mg^{++}

(D) Ca^{++}

Correct Answer: D

Question 81 : The incorrect statement in respect of chromyl chloride test is

(A) formation of red vapours

(B) formation of lead chromate

(C) formation of chromyl chloride

(D) liberation of chlorine

Correct Answer: D

Question 82 : Which of the following alkai metal Ions has lowest ionic mobility in aqueous' Solution :

(A) Rb^+

(B) Cs^+

(C) Li^+

(D) Na^+

Correct Answer: B

Question 83 : At 490° C, the equilibrium the synthesis of HI is 50, the value *K* for the dissociation of HI Will be :

(A) 20.0

(B) 2.0

(C) 0.2

(D) 0.02

Correct Answer: D

Question 84 : The oxidation state of Fe in the brown ring complex: $[Fe(H_2O)_5NO]SO_4$ is

(A) +3

(C) +2

(D) +1

Correct Answer: D

Question 85 : The number of π-bonds in $CH_2 = CH-CH = CH-C = CH$ is :

(A) 2

(B) 5

(C) 4

(D) 3

Correct Answer: C

Question 86 : The normality of 2.3 M H_2SO_4 solution is :

(A) 2.3 N

(B) 4.6 N

(C) 0.46 N

(D) 0.23 N

Correct Answer: B

Question 87 : Hydrolytic reaction of fats with caustic soda is known as :

(A) acetylation

(B) carboxylation

(C) esterification

(D) saponification

Correct Answer: D

Question 88 : Aluminium chloride is a / an :

(A) Bronsted Lowry acid

(B) Arrhenius acid

(C) Lewis acid

(D) Lewisee acid

Correct Answer: C

Question 89 : Argon is used

(A) in filling airships

(B) to obtain low temperature

(C) in high temperature welding

(D) in radiotherapy for treatment of cancer

Correct Answer: C

Question 90 : Which of the following is not used in Friedel-Crafts reaction ?

(A) phenyl acetanilide

(B) bromobenzene

(C) benzene

(D) chlorobenzene

Correct Answer: A

Question 91 : On heating sodium metal in current of dry ammonia, the compound formed is :

(A) sodium amide

(B) sodium azide

(C) sodium nitride

(D) sodium hydride

Correct Answer: A

Question 92 : Hydrogen bonding is maximum in

(A) ethyl chloride

(B) triethyl amine

(C) ethanol

(D) diethyl ether

Correct Answer: C

Question 93 : A reaction that is of the first order with respect to reactant *A* has a rate constant 6 min^{-1}. If We start with [*A*] = 0.5 mol L^{-1}, when would [*A*] reach the value 0.05 mol L^{-1} ?

(A) 0.384 min

(B) 0.15 min

(C) 3 min

(D) 3.84 min

Correct Answer: A

Question 94 : Helium atom is two times heavier than a hydrogen molecule at 298 K. The average kinetic energy of helium is :

(A) four times that of a hydrogen molecule

(B) half that of a hydrogen molecule

(C) two times that of a hydrogen molecule

(D) same as that of a hydrogen molecule

Correct Answer: D

Question 95 : Froth floatation process is used for the metallurgy of :

(A) chloride ores

(B) amalgams

(C) oxide ores

(D) sulphide ores

Correct Answer: D

Question 96 : 10 litre solution of urea contains 240 g urea. The active mass of urea will be :

(A) 0.04

(B) 0.02

(C) 0.4

(D) 0.2

Correct Answer: C

Question 97 : Which of the following does not reduce Benedict's solution ?

(A) sucrose

(B) aldehyde

(C) glucose

(D) fructose

Correct Answer: D

Question 98 : Matte contains mainly :

(A) Cu_2S and FeS

(B) CuS and Fe_2S_3

(C) Fe

(D) Cu_2S

Correct Answer: D

Question 99 : The name of the product obtained by the addition of HI to propene in presence of peroxide catalyst is :

(A) isopropyl iodide

(B) 2-iodo propene

(C) 2-iodopropane

(D) 1-iodopropane

Correct Answer: C

Question 100 : In which of the following, NH_3 is not used?

(A) Tollen's reagent

(B) Nessler's reagent

(C) Group reagent for the analysis of IV group basic radicals

(D) Group reagent for the analysis of III group basic radicals

Correct Answer: B

Question 101 : The calorific value is maximum in case of :

(A) milk

(B) minerals

(C) carbohydrates

(D) proteins

Correct Answer: A

Question 102 : Flux is used to :

(A) remove all impurities from ores

(B) reduce metal oxide

(C) remove silica

(D) remove silica and undesirable metal oxides

Correct Answer: C

Question 103 : Which of the following molecules has the largest root mean square velocity at 25°C ?

(A) CO_2

(B) SO_2

(C) H_2S

(D) NH_3

Correct Answer: D

Question 104 : Stainless steel contains :

(A) Fe + Cr + Cu

(B) Fe + C +Ni

(C) Fe + Cr + Ni

(D) Fe + Ni+ Cu

Correct Answer: C

Question 105 : The radius ratio for tetrahedral shape is :

(A) 0.225 to 0.414

(B) 0.414 to 0.732

(C) 0 to 0.155

(D) 0.155 to 0.225

Correct Answer: A

Question 106 : For the process dry ice -> CO_2 (g)

(A) ΔH is positive while Δp is negative

(B) both ΔH and Δp are negative

(C) both ΔH and Δp are positive

(D) ΔH is negative while Δp is positive

Correct Answer: C

Question 107 : NH3 and BF3 form an adduct readily because they form :

(A) a co-ordinate bond

(B) a hydrogen bond'

(C) an ionic bond

(D) a covalent bond

Correct Answer: A

Question 108 : The function of $Fe(OH)_3$ in the contact process is

(A) to remove arsenic impurity

(B) to detect colloidal impurity

(C) to remove moisture

(D) to remove dust particles

Correct Answer: A

Question 109 : Amino acids usually exist in the form of Zwitter ions. This means that it consists of :

(A) the basic group → NH_2 and the acidic group → COOH

(B) the basic group → NH_3 and the acidic group → CO_2

(C) the basic group → CO_2 and the acidic group → NH_{3+}

(D) no acidic or basic group

Correct Answer: D

Question 110 : A certain compound gives negative test with ninhydrin and positive test with Benedict's solution it is :

(A) an amino acid

(B) a monosaccharide

(C) a lipid

(D) a protein

Correct Answer: D

Question 111 : If formaldehyde and KOH are heated we get :

(A) methane

(B) methyl alcohol

(C) ethyl formate

(D) acetylene

Correct Answer: C

Question 112 : Which of the following reagents is used to distinguish ethene from ethyne ?

(A) bromine in CCl_4

(B) ammonical Cu_2Cl_2

(C) brornine Water

(D) alkaline $KMnO_4$

Correct Answer: B

Question 113 : Brass is an alloy of :

(A) Al and Zn

(B) Cu and Al

(C) Ni and Zn

(D) Cu and Zn

Correct Answer: B

Question 114 : An organic compound on heating with CuO produces CO_2 but no water. The organic compound may be

(A) carbon tetrachloride

(B) chloroform

(C) methane

(D) ethyl iodide

Correct Answer: A

Question 115 : 0.5 mole of each of H_2,SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3 h, the order of partial pressures in the container will be

(A) $pSO_2 > pH_2 > pCH_4$

(B) $pSO_2 > pCH_4 > pH_2$

(C) $pH_2 > pSO_2 > pCH_4$

(D) $pH_2 > pCH_4 > pSO_2$

Correct Answer: B

Question 116 : Which metal is used to make alloy steel for armour plates, safes and helmets?

(A) Al

(B) Mn

(C) Cr

(D) Pb

Correct Answer: A

Question 117 : Iodoform test is not answered by:

(A) C_2H_5OH

(B) CH_3OH

(C) CH_3COCH_3

(D) $CH_3—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3$

Correct Answer: B

Question 118 : A gaseous carbon compound is soluble in dilute HCl. The solution on treating with $NaNO_2$ gives off nitrogen leaving behind a solution which smells of wood spirit. The carbon compound is:

(A) HCHO

(B) CO

(C) $C_2H_5NH_2$

(D) CH_3NH_2

Correct Answer: D

Question 119 : Which of the following statements is incorrect regarding benzyl chloride?

(A) It gives white precipitate with alcoholic $AgNO_3$

(B) It is an aromatic compound with substitution in the side chain

(C) It undergoes nucleophilic substitution reaction

(D) It is less reactive than vinyl chloride

Correct Answer: D

Question 120 : Enthalpy of formation of HF and HCl are the following -161 kJ and -92 kJ respectively. Which of the following statements is incorrect?

(A) HCl is more stable than HF

(B) HF and HCl are exothermic compounds

(C) the affinity of fluorine to hydrogen is greater than the affinity of chlorine to hydrogen

(D) HF is more stable than HCl

Correct Answer: A

SUBJECT: Mathematics

Question 121 :

If A = {x : x = 4n + 1, 2 £ n £ 5},then number of subsets of A is

(A) 16

(B) 15

(C) 4

(D) None of these

Correct Answer: A

Question 122 :

Let A and B be two non-empty subsets of a set X such that A is not a subset of B, then

(A) A is always a subset of the complement of B

(B) B is always a subset of A

(C) A and B are always disjoint

(D) A and the complement of B are always non-disjoint

Solution : Since, A is not a subset of B, therefore some elements of A will not be elements of B. Hence, A and complement of B are always non-disjont.

Correct Answer: D

Question 123 : Let A = {x, y, z} and B = {a, b, c, d}. Then, which one of the following is not a relation from A to B?

(A) {(x, a), (x, c)}

(B) {(y, c), (y, b)}

(C) {(z, a), (z, d)}

(D) {(z, b), (y, b), (a, d)}

Solution : In option (d), $a \notin A$

$\therefore$ It is not a relation.

Correct Answer: D

Question 124 :

The relation R defined on the set of natural numbers as {(a, b): a differs from b by 3} is given by

(A) {(4, 1), (5, 2), (6, 3),....}

(B) {(1, 3), (2, 6), (3, 9),....}

(C) {(1, 4), (2, 5), (3, 6),....}

(D) None of the above

Solution :

Given, R = {(a, b) : a differs from b by 3}

$\because$ $b - a = 3 \Rightarrow b = a + 3$

$\therefore$ R = {(1, 4), (2, 5), (3, 6).....}

Correct Answer: C

Question 125 : The value of $\frac{4(\cos 75° + i \sin 75°)}{0.4(\cos 30° + i \sin 30°)}$ is

(A) $\frac{\sqrt{2}}{10}(1+i)$

(B) $\frac{\sqrt{2}}{10}(1-i)$

(C) $\frac{10}{\sqrt{2}}(1-i)$

(D) $\frac{10}{\sqrt{2}}(1+i)$

Solution :

$$\frac{4(\cos 75° + i \sin 75°)}{0.4(\cos 30° + i \sin 30°)}$$

$= 10(\cos 75° + i \sin 75°)(\cos 30° - i \sin 30°)$

$= 10e^{75i} \cdot e^{-30i} = 10e^{45i}$

$= 10(\cos 45° + i \sin 45°) = \frac{10}{\sqrt{2}}(1+i)$

Correct Answer: D

Question 126 : If ω is imaginary cube root of unity, then $\Delta = \begin{vmatrix} 1 & 1+i+\omega & \omega \\ 1-i & -1 & \omega-1 \\ -i & -i+\omega^2-1 & -1 \end{vmatrix}$ is equal to

(A) i

(B) ω

(C) 1

(D) Zero

Solution : Given,

$$\Delta = \begin{vmatrix} 1 & 1+i+\omega & \omega \\ 1-i & -1 & \omega-1 \\ -i & -i+\omega^2-1 & -1 \end{vmatrix}$$

$$= \begin{vmatrix} 1 & i-\omega^2 & \omega \\ 1-i & -1 & \omega-1 \\ -i & -i+\omega^2-1 & -1 \end{vmatrix} \quad [\because 1+\omega+\omega^2=0]$$

Now, $R_1 \to R_1 + R_3$

$$\Rightarrow \Delta = \begin{vmatrix} 1-i & -1 & \omega-1 \\ 1-i & -1 & \omega-1 \\ -i & -i+\omega^2-1 & -1 \end{vmatrix}$$

Here, R_1 and R_2 are identical

$\therefore \Delta = 0$

Correct Answer: D

Question 127 : The sum of the series $1 + \frac{1}{4.2!} + \frac{1}{16.4!} + \frac{1}{64.6!} + \ldots$ is

(A) $\frac{e+1}{2\sqrt{e}}$

(B) $\frac{e-1}{2\sqrt{e}}$

(C) $\frac{e+1}{\sqrt{e}}$

(D) $\frac{e-1}{\sqrt{e}}$

Solution :

We know that,

$$\frac{e^x+e^{-x}}{2}=1+\frac{x^2}{2!}+\frac{x^4}{4!}+\frac{x^6}{6!}+.....$$

On putting $x=\frac{1}{2}$, we get

$$\frac{e^{1/2}+e^{-1/2}}{2}=1+\left(\frac{1}{2}\right)^2\frac{1}{2!}+\left(\frac{1}{2}\right)^4\frac{1}{4!}+.....$$

$$\Rightarrow \frac{e+1}{2\sqrt{e}}=1+\frac{1}{4.2!}+\frac{1}{16.4!}+.....\infty$$

Correct Answer: A

Question 128 :

The domain of a sequence can be subset of natural numbers of the type

(A) {3, 4, 5,.....k}

(B) {1, 2, 3, 4, 5,.....k}

(C) {0, 1, 2, 3, 4.,....k}

(D) None of the above

Solution : The domain of a sequence can be subset of natural numbers of the type {1, 2, 3,....., k}.

Correct Answer: B

Question 129 : If n is positive odd integer, then n3 – n is divisible by

(A) 32

(B) 24

(C) 18

(D) 15

Solution : n3 – n = (n – 1)n(n + 1) = product of three consecutive positive integers and is divisible by 3! = 6.
Also, (n – 1) and (n + 1) are consecutive even integers and their product is divisible by 4.
Hence, n3 – n is divisible by 6 × 4 = 24 if n is positive odd.

Correct Answer: B

Question 130 : $n^7 – n$ is divisible by

(A)50

(B) 45

(C) 40

(D) 42

(E) 42

Solution : Since, 7 is prime, therefore by Fermet's theorem, we have

$n^7 = (\text{mod } 7)$

i.e. $7|(n^7 - n)$ .....(i)

Also, $n^7 - n = n(n^6 - 1) = n(n^3 - 1)(n^3 + 1)$

$= n(n - 1)(n^2 + n + 1)(n + 1)(n^2 - n + 1)$

$= (n - 1)n\ (n + 1)(n^2 + n + 1)(n^2 - n + 1)$

Now, $(n - 1)n(n + 1)$ is a product of three consecutive integers and so it is divisible by 3! i.e. 6.

Thus, $6|(n^7 - n)$ .....(ii)

Since, $(6, 7) = 1$ i.e. 6 and 7 are relatively prime, therefore, from eqs. (i) and (ii), we have,

$(6.7)|\ (n^7 - n) \Rightarrow 42|\ (n^7 - n)$

Correct Answer: D

Question 131 : Four speakers will address a meeting where speaker Q will always speak after speaker P. Then, the number of ways in which the order of speakers can be prepared, is

(A) 256

(B) 128

(C) 24

(D) 12

Solution : Four speakers will address the meeting in 4! ways = 24 different ways in which half number of cases will be such that P speaks before Q and half number of cases will be such that P speaks after Q.

$\therefore$ Required number of ways $= \frac{24}{2} = 12$

Correct Answer: D

Question 132 : In how many different ways can the letters of the word MATHEMATICS be arranged ?

(A) 11!

(B) 11! / 2!

(C) $11! / (2!)^2$

(D) $11! / (2!)^3$

Solution :

In the word 'MATHEMATICS' the letters are 2A, C
E, H, I, 2M, S, 2T.
∴ Total number of different words

$$= \frac{11!}{2!2!2!} = \frac{11!}{(2!)^3}$$

Correct Answer: D

Question 133 : By using the first three terms of its expansion, the approximate value of $(0.99)^5$ is

(A)0.949

(B) 0.951

(C) 0.954

(D) None of the above

Solution :

Correct Answer: B

Question 134 : If nC_4, nC_5 and nC_6 are in AP, then n is

(A) 7 or 14

(B) 7

(C)14

(D) 14 or 21

$(0.99)^5 = (1 - 0.01)^5$

$= {}^5C_0(1)^5 - {}^5C_1(1)^4(0.01) + {}^5C_2(1)^3(0.01)^2$

(ignore the other terms)

$= 1 - 5 \times 1 \times 0.01 + \frac{5 \times 4}{2} \times 1 \times 0.01 \times 0.01$

Solution : $= 1 - 0.05 + 10 \times 0.0001 = 0.951$

Correct Answer: A

Question 136 : The quadratic equations $x^2 - 6x + a = 0$ and $x^2 - cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4 : 3. Then, the common root is

(A) 2

(B) 1

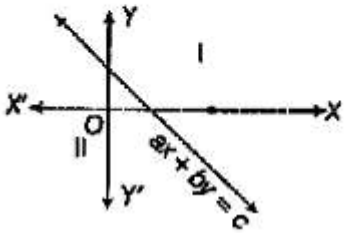
(C) 4

(D) 3

Solution :

Correct Answer: A

The graph of the inequality ax + by > c is represented by shading in the ....A.... . Here, A refers to



Question 137 :

(A) half plane I including the point on ax + by + c

(B) half plane II including the point on ax + by + c

(C) half plane I not including the point on ax + by + c

(D) half plane II not including the point on ax + by + c

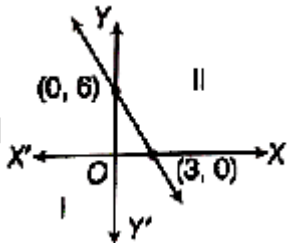
Solution : The graph of the inequality ax + by > c will be half plane I (called solution region) and represented by shading half plane I not including the point on the line ax + by = c.

Correct Answer: C

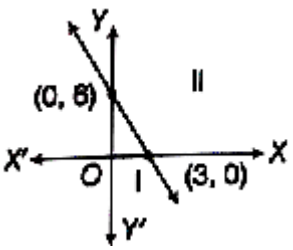
The graph of the inequality 40x + 20y ≤ 120, x ≥ 0, y ≥ 0 is

Question 138 :

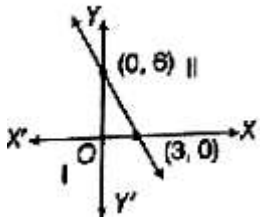
(A)



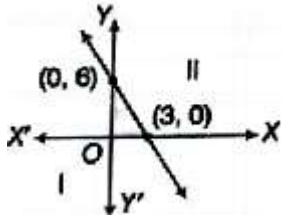
(B)



(C)



(D)

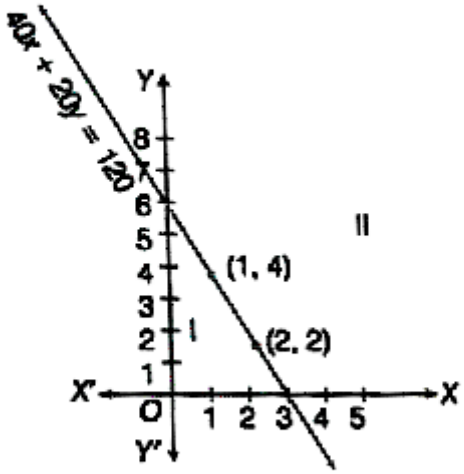


Solution :

We have,

$40x + 20y \leq 120, x \geq 0, y \geq 0$ .....(i)

In order to draw the graph of the inequality (i), we take one (0, 0), in half plane I and check whether values of x and y satisfy the inequality or not.



We observe that x = 0 y= 0 satisfy the inequality. Thus, we say that the half plane I is the graph of the inequality. Since, the points on the line also satisfy the inequality (i) above, the line is also a part of the (i) will consist of all the points of its graph (half plane I including the line).

Also, since it is given x > 0, y > 0, x and y can only take positive values in half plane I.

Correct Answer: D

Question 139 : If A is a square matrix of order n × n, then adj (adj A) is equal to

(A) $|A|^n A$

(B) $|A|^{n-1} A$

(C) $|A|^{n-2} A$

(D) $|A|^{n-3} A$

Solution : By the property of adjoint of a matrix,
adj(adj A) = $|A|^{n-2}A$

Correct Answer: C

Question 140 : The inverse of the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is

(A) $\frac{1}{24}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

(C) $\frac{1}{24}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$

Solution :

$$\text{Given, } A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

$$\text{Now, } |A| = 2\,(12 - 0) = 24$$

$$\therefore \text{ adj}(A) = \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}^T$$

$$= \begin{bmatrix} 12 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 6 \end{bmatrix}^T = \begin{bmatrix} 12 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 6 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{1}{|A|}\text{adj}(A)$$

$$= \frac{1}{24}\begin{bmatrix} 12 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 6 \end{bmatrix} = \begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1/3 & 0 \\ 0 & 0 & 1/4 \end{bmatrix}$$

Correct Answer: D

Question 141 : The equation of the line joining (1, 2) and (3, 6) using determinants is

(A) y = x

(B) 2y = x

(C) 2x = y

(D) x = 3y

Solution : If using the relation

$$\frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$ for finding the equation of line Make (x_1, y_1) as (1, 2) and (x_2, y_2) as (3, 6) and f(x_3, y_3) as (x, y) solve to get equation of line.

Let P (x, y) be any point on the line joining A (1, 2) and B (3, 6). If the points A, B and P are collinear, then the area of ΔABP will be zero.

$$\therefore \frac{1}{2}\begin{vmatrix} 1 & 2 & 1 \\ 3 & 6 & 1 \\ x & y & 1 \end{vmatrix} = 0$$

$$\Rightarrow \frac{1}{2}[1(6 - y) - 2(3 - x) + 1(3y - 6x)] = 0$$

$$\Rightarrow 2y - 4x = 0 \Rightarrow y = 2x$$

Hence, the equation of the joining the given points is y = 2x.

Correct Answer: C

Question 142 : If the system of equations
x + ky – z = 0, 3x – ky – z = 0 and
x – 3y + z = 0 has non-zero solution, then k is equal to

(A) – 1

(B) ZERO

(C) 1

(D) 2

It has a non-zero solution, if

$$\begin{vmatrix} 1 & k & -1 \\ 3 & -k & -1 \\ 1 & -3 & 1 \end{vmatrix} = 0$$

$\Rightarrow 1(-k-3) - k(3+1) - 1(-9+k) = 0$

$\Rightarrow -6k + 6 = 0$

Solution : $\Rightarrow k = 1$

Correct Answer: C

Question 143 : If $\sin(x + 3a) = 3\sin(a - x)$, then

(A) $\tan x = \tan a$

(B) $\tan x = \tan^2 a$

(C) $\tan x = \tan^3 a$

(D) $\tan x = 3 \tan a$

Given, $\frac{\sin(x+3a)}{\sin(a-x)} = 3$

On applying componendo and dividendo rule, we get

$$\frac{\sin(x+3a)+\sin(a-x)}{\sin(x+3a)-\sin(a-x)} = \frac{3+1}{3-1}$$

$$\Rightarrow \frac{2\sin 2a\cos(a+x)}{2\cos 2a\sin(a+x)} = 2$$

$$\Rightarrow \frac{\tan 2a}{\tan(a+x)} = 2$$

$$\Rightarrow \frac{2\tan a}{1-\tan^2 a} \times \frac{(1-\tan a\tan x)}{(\tan a+\tan x)} = 2$$

$\Rightarrow \tan a - \tan^2 a \tan x = \tan a + \tan x - \tan^3 a - \tan^2 a \tan x$

Solution : $\Rightarrow \tan x = \tan^3 a$

Correct Answer: C

Question 144 : If x and y are acute angles, such that

$\cos x + \cos y = \frac{3}{2}$ and $\sin x + \sin y = \frac{3}{4}$,

then $\sin(x + y)$ equals

(A) $\frac{2}{5}$

(B) $\frac{3}{4}$

(C) $\frac{3}{5}$

(D) $\frac{4}{5}$

Solution :

Given, $\cos x + \cos y = \frac{3}{5}$

$\Rightarrow 2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right) = \frac{3}{2}$ .....(i)

and $\sin x + \sin y = \frac{3}{4}$

$\Rightarrow 2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right) = \frac{3}{4}$ .....(ii)

On dividing Eq. (ii) by Eq. (i), get

$$\frac{2\sin\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)}{2\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)} = \frac{\frac{3}{4}}{\frac{3}{2}}$$

$\Rightarrow \tan\left(\frac{x+y}{2}\right) = \frac{1}{2}$

$$\therefore \sin(x+y) = \frac{2\tan\left(\frac{x+y}{2}\right)}{1+\tan^2\left(\frac{x+y}{2}\right)}$$

$$= \frac{2\tan\frac{1}{2}}{1+\left(\frac{1}{2}\right)^2} = \frac{4}{4+1} = \frac{4}{5}$$

Correct Answer: D

Question 145 : The domain of the function defined by $f(x) = \sin^{-1} x + \cos x$ is

(A) $[-1, 1]$

(B) $[-1, \pi + 1]$

(C) $(-\infty, \infty)$

(D) ϕ

Solution : The domain of $\cos x$ is R and the domain of $\sin^{-1} x$ is $[-1, 1]$

$\therefore$ Domain of $\sin^{-1} x + \cos x$ $[-1, 1] \cap R = [-1, 1]$

Correct Answer: A

Question 146 : $\cos^{-1}\left[\cos\left(2\cot^{-1}\left(\sqrt{2}-1\right)\right)\right]$ is equal to

(A) $\sqrt{2}-1$

(B) $\frac{\pi}{4}$

(C) $\frac{3\pi}{4}$

(D) ZERO

Solution :

$$\cot^{-1}\left(\sqrt{2}-1\right)=\frac{\pi}{2}-\tan^{-1}\left(\sqrt{2}-1\right)$$

$$=\frac{\pi}{2}-\tan^{-1}\left(\tan\frac{\pi}{8}\right)$$

$$\frac{\pi}{2}-\frac{\pi}{8}=\frac{4\pi-\pi}{8}=\frac{3\pi}{8}=67.5$$

$$\therefore\ \cos^{-1}\left[\cos\left\{2\cot^{-1}\left(\sqrt{2}-1\right)\right\}\right]$$

$$=\cos^{-1}[\cos\{2\times 67.5\}]$$

$$=\cos^{-1}[\cos 135^\circ]=135^\circ=\frac{3\pi}{4}$$

Correct Answer: C

Question 147 : The set of points,where $f(x)=\frac{x}{1+|x|}$ where is differentiable, is

(A) $(-\infty,-1)\cup(-1,\infty)$

(B) $(-\infty,\infty)$

(C) $(0,\infty)$

(D) $(-\infty,0)\cup(0,\infty)$

Solution :

Let $f(x) = \frac{g(x)}{h(x)} = \frac{x}{1+|x|}$

It is clear that, $g(x) = x$ and $h(x) = 1 + |x|$ are differentiable on $(-\infty, \infty)$ and $(-\infty, 0) \cup (0, \infty)$, respectively. Thus, $f(x)$ is differentiable on $(-\infty, 0) \cup (0, \infty)$. Now we have to check the differentiability at $x = 0$.

$$\therefore \lim_{x \to 0} \frac{f(x) - f(0)}{x - 0} = \lim_{x \to 0} \frac{\frac{x}{1+|x|} - 0}{x}$$

$$= \frac{lim}{x \to 0} \frac{1}{1+|x|} = 1$$

Hence, $f(x)$ is differentiable on $(-\infty, \infty)$

Correct Answer: B

If $f(x)\begin{cases} 1, & \forall \quad x < 0 \\ 1 + \sin x, & \forall\ 0 \le x \pi / 2' \end{cases}$ then what is the

Question 148 : value of $f'(x)$ at $x = 0$?

(A) 1

(B) -1

(C) ∞

(D) does not exist

$$\text{LHD} = \lim_{h\to 0}\frac{f(0-h)-f(0)}{-h}$$

$$= \lim_{h\to 0}\frac{1-1}{-h} = 0$$

$$\text{RHD} = \lim_{h\to 0}\frac{f(0+h)-f(0)}{h}$$

$$= \lim_{h\to 0}\frac{1+\sin(0+h)-1}{h}$$

Solution : $$= \lim_{h\to 0}\frac{\sin h}{h} = 1 \Rightarrow \text{LHD} \neq \text{RHD}$$

Correct Answer: D

Question 149 : If $y = x + e^x$, then what is $\frac{d^2x}{dy^2}$ is equal to?

(A) e^x

(B) $-\frac{e^x}{(1+e^x)^3}$

(C) $-\frac{e^x}{(1+e^x)}$

(D) $-\frac{e^x}{(1+e^x)^2}$

Solution :

$$Q\ y = x + e^x$$

$$\therefore \frac{dy}{dx} = 1 + e^x \Rightarrow \frac{dx}{dy} = \frac{1}{1+e^x}$$

$$\Rightarrow \frac{d^2x}{dy^2} = -\frac{e^x}{(1+e^x)^2} \cdot \frac{dx}{dy}$$

$$= -\frac{e^x}{(1+e^x)^2} \cdot \frac{1}{(1+e^x)} = -\frac{e^x}{(1+e^x)^3}$$

Correct Answer: D

Question 150 : If $y = \frac{x+1}{x-1}$, then what is the value of $\frac{dy}{dx}$?

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

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

(C) $\frac{2}{(x-1)^2}$

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

Solution :

We have, $y = \frac{x+1}{x-1}$

Now, differentiating w.r.t. x, we get

$$\frac{dy}{dx} = \frac{(x-1)\frac{d}{dx}(x+1) - (x+1)\frac{d}{dx}(x-1)}{(x-1)^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{(x-1).1 - (x+1).1}{(x-1)^2}$$

$$\Rightarrow \frac{dy}{dx} = \frac{x-1-x-1}{(x-1)^2} = \frac{-2}{(x-1)^2}$$

Correct Answer: B

Question 151 : The interval in which $f(x) = 2x^3 + 3x^2 - 12x + 1$ is increasing, is

(A) $(-\infty, -2] \cup [1, \infty)$

(B) $(-\infty, -2) \cup (1, \infty)$

(C) $(-\infty, -2] \cup (1, \infty)$

(D) $(-\infty, -2]$

Solution :

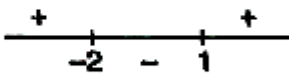
Given, $f(x) = 2x^3 + 3x^2 - 12x + 1$

On differentiating w.r.t. x, we get

$f'(x) = 6x^2 + 6x - 12$

$\Rightarrow f'(x) = 6(x^2 + x - 2)$

$\Rightarrow f'(x) = 6(x + 2)(x - 1)$



Hence, $f'(x) \geq 0$

when, $x \in (-\infty, -2] \cup [1, \infty)$

$\Rightarrow f(x)$ is increasing when

$x \in (-\infty, -2] \cup [1, \infty)$

Correct Answer: A

Question 152 : The interval in whcih the function $f(x) = (x + 2)e^{-x}$ is decreasing in

(A) $(-1, \infty)$

(B) $(-1, 1)$

(C) $(-1, 2)$

(D) $(1, 2)$

Solution :

We have, $f(x) = (x + 2)e^{-x}$

On differentiating w.r.t. x, we get

$f'(x) = e^{-x} - (x + 2)e^{-x}$

$= -e^{-x}(x + 1)$

For decreasing function, $f'(x) < 0$

$\Rightarrow -e^{-x}(x + 1) < 0$

$\Rightarrow -e^{-x}(x + 1) > 0$

$\Rightarrow x > 0$

Hence, f(x) is decreasing in $(-1, \infty)$.

Correct Answer: A

Question 153 : If $I_n = \int (\log x)^n dx$, then $I_n + nI_{n-1}$ is equal to to

(A) $x(\log x)^n$

(B) $(x\log x)^n$

(C) $(\log x)^{n-1}$

(D) $n(\log x)^n$

$I_n = \int (\log x)^n dx$ .....(i)

$\therefore I_{n-1} = \int (\log x)^{n-1} dx$ .....(ii)

Now, $I_n = \int (\log x)^n dx$

$= (\log x)^n x - n \int (\log x)^{n-1} \cdot \frac{1}{x} \cdot x dx$

$= x(\log x)^n - n \int (\log x)^{n-1} \cdot \frac{1}{x} \cdot x dx$

$\Rightarrow I_n = x(\log x)^n - nI_{n-1}$

Solution : $\therefore I_n + nI_{n-1} = x(\log x)^n$

Correct Answer: A

Question 154 : $\lim_{n\to\infty}\left(\frac{1}{n}+\frac{1}{n+1}+....+\frac{1}{3n}\right)$ is equal to

(A) log2

(B) log3

(C) log5

(D) ZERO

$\lim_{n\to\infty}\left(\frac{1}{n}+\frac{1}{n+1}+.....+\frac{1}{n+2n}\right)$

$= \sum_{r=0}^{2n} \frac{1}{n-r} = \frac{1}{n} \sum_{r=0}^{2n} \frac{1}{1+\frac{r}{n}}$

$= \int_0^2 \frac{1}{1+x} dx = [\log(x+1)]_0^2$

Solution : $= \log 3 - \log 1 = \log 3$

Correct Answer: B

Question 155 : If xdy = y(dx + ydy), y(1) = 1 and y(x) > 0, then y(–3) is equal to

(A) 3

(B) 2

(C) 1

(D) ZERO

Solution :

Given, $\frac{x dy - y dx}{y^2} = dy$

$\Rightarrow d\left(\frac{x}{y}\right) = -dy$

$\Rightarrow \frac{x}{y} = -y + c$ [integrating]

As $y(1) = 1 \Rightarrow c = 2$

$\therefore \frac{x}{y} + y = 2$

For $x = -3, -3 + y^2 = 2y$

$\Rightarrow (y + 1)(y - 3) = 0$

Also, $y > 0 \Rightarrow y = 3$ [neglecting $y = -1$]

Correct Answer: A

Question 156 : What is the degree of the differential equation $\left(1+\frac{dy}{dx}\right)^4 = \left(\frac{d^2y}{dx^2}\right)^2$?

(A) 1

(B) 2

(C) 4

(D) 8

Solution :

The given differential equation is

$$\left(1+\frac{dy}{dx}\right)^4 = \left(\frac{d^2y}{dx^2}\right)^2$$

From above, it is clear that degree of given differential equation is 2.

Q (Degree of differential equation

= Degree of the highest order derivative

Correct Answer: B

Question 157 : The angle between the lines 2x – y + 3 = 0 and x + 2y + 3 = 0 is

(A) 90º

(B) 60º

(C) 45º

(D) 30º

Solution :

We know that, angle between two lines is

$$\tan\theta = \frac{m_1 - m_2}{1 + m_1 m_2}.$$

The slopes of the given lines are

$$m_1 = 2,\ m_2 = -\frac{1}{2}$$

$$\text{Now, } m_1 m_2 = \left(-\frac{1}{2}\right)(2) = -1$$

So, the lines are perpendicular

$\therefore \theta = 90^\circ$

Correct Answer: A

Question 158 : The value of λ for which the lines $3x + 4y = 5$, $5x + 4y = 4$ and $\lambda x + 4y = 6$ meet at a point is

(A) 2

(B) 1

(C) 4

(D) 3

Solution : Given, lines are $3x + 4y = 5$, $5x + 4y = 4$ and $\lambda x + 4y = 6$. These three lines meet at a point, if the point of intersection of first two lines lies on the third line.

Now, point of intersection of line $3x + 4y = 5$ and $5x + 4y = 4$ is $\left(-\frac{1}{2}, \frac{13}{8}\right)$.

The line $\lambda x + 4y = 6$ passes through the point $\left(-\frac{1}{2}, \frac{13}{8}\right)$.

$\therefore \lambda\left(-\frac{1}{2}\right) + 4\left(\frac{13}{8}\right) = 6$

$\Rightarrow -\lambda + 13 = 12 \Rightarrow \lambda = 1$

Correct Answer: B

Question 159 : The equation of normal to the circle x2 + y2 – 5x + 2y – 48 = 0 at the ponit (5, 6) is

(A) 14x – 5y + 40 = 0

(B) 14x + 5y + 40 = 0

(C) $14x - 5y - 40 = 0$

(D) $14x + 5y - 40 = 0$

Solution :

Equation of the normal to the given circle at (5, 6) is

$$\frac{x-5}{5-\frac{5}{2}} = \frac{y-6}{6+1}$$

$$\Rightarrow \frac{x-5}{\frac{5}{2}} = \frac{y-6}{7} \Rightarrow \frac{2x-10}{5} = \frac{y-6}{7}$$

$$\Rightarrow 14x - 70 = 5y - 30$$

$$\Rightarrow 14x - 5y - 40 = 0$$

Correct Answer: C

Question 160 : The equation of pair of tangents to the circle $x^2 + y^2 = 16$ drawn from the point (1, 4) is

(A) $x^2 + y^2 - x - 4y = 0$

(B) $x^2 + y^2 + x - 4y = 0$

(C) $x^2 + y^2 - 2x - 8y = 0$

(D) None of these

Solution :

Equation of pair of tangents to the circle $x^2 + y^2 = 16$ at the point (1 , 4) is

$$(x^2 + y^2 - 16)(1 + 16 - 16) = (x + 4y - 16)^2$$

$$\Rightarrow x^2 + y^2 - 16 = (x + 4y - 16)^2$$

$$\Rightarrow x^2 + y^2 - 16 = x^2 + 16y^2 + 256 + 8xy - 128 - 32x$$

$$\Rightarrow 15y^2 + 8xy - 32x + 112 = 0$$

Correct Answer: D

Question 161 : The vertex of the parabola $x^2 + 2y = 8x - 7$ is

(A) $\left(\frac{9}{2}, 0\right)$

(B) $\left(4, \frac{9}{2}\right)$

(C) $\left(2, \frac{9}{2}\right)$

(D) $\left(4, \frac{7}{2}\right)$

Solution : Given, equation can be rewritten as

$(x - 4)^2 = -2\left(y - \frac{9}{2}\right)$

So, the vertex of the parabola is $\left(4, \frac{9}{2}\right)$

Correct Answer: B

Question 162 : A parabola has the origin as its focus and the line x = 2 as the directrix. Then, the vertex of the parabola is at

(A) (2, 0)

(B) (0, 2)

(C) (1, 0)

(D) (0, 1)

Solution : The vertex is a mid-point of focus and directrix. Hence, coordinates of vertex is (1, 0).

Correct Answer: C

Question 163 : What is the value of λ for which $(\lambda\hat{i}+\hat{j}-\hat{k})\times(3\hat{i}-2\hat{j}+4\hat{k}) = (2\hat{i}-11\hat{j}-7\hat{k})$?

(A) 2

(B) –2

(C) 1

(D) 7

Solution : Given, $(\lambda\hat{i}+\hat{j}-\hat{k})\times(3\hat{i}-2\hat{j}+4\hat{k}) = (2\hat{i}-11\hat{j}-7\hat{k})$

$$\Rightarrow \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \lambda & 1 & -1 \\ 3 & -2 & 4 \end{vmatrix} = (2\hat{i}-11\hat{j}-7\hat{k})$$

$$\Rightarrow 2\hat{i}-(4\lambda+3)\hat{j}+(-2\lambda-3)\hat{k} = 2\hat{i}-11\hat{j}-7\hat{k}$$

$(4\lambda+3) = 11 \Rightarrow \lambda = 2$

Correct Answer: A

Question 164 : The area of the parallelogram whose adjacent sides are $\hat{i}+\hat{k}$ and $2\hat{i}+\hat{j}+\hat{k}$, is

(A) 3

(B) $\sqrt{2}$

(C) 4

(D) $\sqrt{3}$

Solution :

Let adjacent sides of a parallelogram area

$\mathbf{a} = \hat{i} + \hat{k}$ and $\mathbf{b} = 2\hat{i} + \hat{j} + \hat{k}$

$\therefore$ Area of parallelogram = $||\mathbf{a} \times \mathbf{b}||$ t

$$= \begin{Vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 0 & 1 \\ 2 & 1 & 1 \end{Vmatrix}$$

$$= |\hat{i}(0-1) - \hat{j}(1-2) + \hat{k}(1-0)|$$

$$= |-\hat{i} + \hat{j} + \hat{k}|$$

$= \sqrt{(-1)^2 + (1)^2 + (1)^2} = \sqrt{3}$ sq. unit

Correct Answer: D

Question 165 : [b × c c × a a × b] is equal to

(A) [a b c]

(B) 2[a b c]

(C) $[a\ b\ c]^2$

(D) a × (b × c)

Solution :

We know, $[\mathbf{b} \times \mathbf{c}\ \ \mathbf{c} \times \mathbf{a}\ \ \mathbf{a} \times \mathbf{b}]$

$= (\mathbf{b} \times \mathbf{c})[(\mathbf{c} \times \mathbf{a}).(\mathbf{a} \times \mathbf{b})]$

$= (\mathbf{b} \times \mathbf{c})[(\mathbf{c} \times \mathbf{a})\mathbf{b}]\mathbf{a} - [(\mathbf{c} \times \mathbf{a})\mathbf{a})\mathbf{b}]$

$= (\mathbf{b} \times \mathbf{c})(\mathbf{cab})\mathbf{a} - (\mathbf{caa})\mathbf{b}]$

$= (\mathbf{b} \times \mathbf{c})\mathbf{a}[\mathbf{abc}] - 0$

$= [\mathbf{abc}][\mathbf{abc}] = [\mathbf{abc}]^2$

Correct Answer: C

The distance of the point (1, –5, 9) from the plane $x - y + z = 5$ measured along a straight $x = y = z$ is $2\sqrt{3}k$, then the value of k is

Question 166 :

(A) 5

(B) 6

(C) $\sqrt{3}$

(D) 4

Given equation of plane is $x - y + z = 5$.
The distance measured along the line $x = y = z$.
So, the direction ratios of the given line is (1, 1, 1).
$\therefore$ Equation of line PQ is

Now, let $\frac{x-1}{1} = \frac{y+5}{1} = \frac{z-9}{1} = \lambda$

$\Rightarrow x = \lambda + 1,\ y = \lambda - 5,\ z = 5$
lies on the plane $x - y + z = 5$
$\Rightarrow \lambda + 1 - \lambda + 5 + \lambda + 9 = 5$
$\Rightarrow \lambda = -10$
The coordinates of Q is (–9, –15, –1) and the coordiants of P is (1, –5, 9).

Now, $PQ = \sqrt{(1+9)^2 + (-5+15)^2 + (9+1)^2}$

Solution : $\therefore\ 2\sqrt{3}k = 10\sqrt{3} \Rightarrow k = 5$

Correct Answer: A

Equation of the plane perpendicular to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and passing through the point (2, 3, 4)

Question 167 : is

(A) 2x + 3y + z = 17

(B) x + 2y + 3z = 9

(C) $3x + 2y + z = 16$

(D) $x + 2y + 3z = 20$

Solution :

Equation of plane passing through (2, 3, 4) is

$a(x - 2) + b(y - 3) + c(z - 4) = 0$ .....(i)

Since, above plane is perpendicular to the line.

$\therefore \frac{x}{1} = \frac{y}{2} = \frac{z}{3}$

Thus, normal to the plane is parallel to the line. So

DR's of normal are (1, 2, 3).

i.e. (a, b, c) = (1, 2, 3)

From eq. (i),

$1(x - 2) + 2(y - 3) + 3(z - 4) = 0$

$\Rightarrow x + 2y + 3z = 20$

Correct Answer: D

Question 168 : The equation of the plane containing the lines $\frac{x-1}{2} = \frac{y+1}{-1} = \frac{z}{3}$ and $\frac{x}{2} = \frac{y-2}{-1} = \frac{z+1}{3}$ is

(A) $8x - y + 5z - 8 = 0$

(B) $8x + y - 5z - 7 = 0$

(C) $x - 8y + 3z + 6 = 0$

(D) $8x + y - 5z + 7 = 0$

Solution :

Equation of plane is $a(x - 1) + b(y + 1) + cz = 0$

[Q plane is passing through (1, –1, 0)]

Above plane also passing through (0, 2, –1).

$\therefore -a + 3b - c = 0$

Also, $2a - b + 3c = 0$

$\Rightarrow \frac{a}{8} = \frac{b}{1} = \frac{c}{-5}$

Hence, equation of plane is

$8x + y - 5z - 7 = 0$

Correct Answer: B

Question 169 : For dealing with qualitative data the best average is

(A) AM

(B) GM

(C) median

(D) mode

Solution : For dealing with qualitative data, the best average is median.

Correct Answer: C

Question 170 : In a moderately asymmetrical distribution, if the mean and median are 36 and 34 respectively, then find out the value of empirical mode.

(A) 30

(B) 32

(C) 42

(D) 22

Solution : Given, mean = 36, median = 34
We know that,
Mode = 3 Median – 2 Mean
$= 3 \times 34 - 2 \times 36 = 102 - 72 = 30$

Correct Answer: A

Question 171 : Following are the marks obtained by 9 students in a Mathematics test 50, 69, 20, 33, 53, 39, 40, 65, 59.The mean deviation from the median is

(A) 9

(B) 10.5

(C) 12.67

(D) 14.76

Solution :

First, given marks are arranged in ascending order

20, 33, 39, 40, 50, 53, 59, 65, 69.

$\therefore$ Median, $M_d = \left(\frac{9+1}{2}\right)$th term 5th term = 50

$\therefore$ Mean deviation, $MD = \frac{\sum_{i=1}^{9} |x_i - M_d|}{n}$

$$= \frac{|20-50|+|33-50|+|39-50| \\ +|40-50|+|50-50|+|53-50| \\ +|59-50|+|65-50|+|69-50|}{9}$$

$$= \frac{114}{9} = 12.67$$

Correct Answer: C

Question 172 : The mode of the Binomial distribution for which mean and standard deviation are 10 and $\sqrt{5}$ respectively, is

(A) 7

(B) 8

(C) 9

(D) 10

In Binomial distribution, mean
= np = 10, variance = npq = 5

$\therefore\ p = q = \frac{1}{2}$

Let x be the mode, then
np + p > x > np – q

$\therefore\ 10 + \frac{1}{2} > x > 10 - \frac{1}{2} \Rightarrow 9.5 < x < 10.5$

Solution : x = 10

Correct Answer: D

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f the mean and standard deviation of a Binomial variate X are 4 and $\sqrt{3}$, respectively, then P(X ≥ 1)

Question 173 : is equal to

(A) $1-\left(\frac{1}{4}\right)^{16}$

(B) $1-\left(\frac{3}{4}\right)^{16}$

(C) $1-\left(\frac{2}{3}\right)^{16}$

(D) $1-\left(\frac{1}{3}\right)^{16}$

Mean = np = 4
Variance = nqp = 3
On solving, we get

$q = \frac{3}{4}, n = 16, p = \frac{1}{4}$

Now, P(X ≥ 1) = 1 – P(X = 0)

$= 1 - {}^{n}C_{0}\, p^{0} q^{n-0} = 1 - \left(\frac{3}{4}\right)^{16}$

Solution :

Correct Answer: D

Question 174 : A four-digit number is formed by the digits 1, 2, 3 , 4 with no repetition. The probability that the number is odd, is

(A) zero

(B) $\frac{1}{3}$

(C) $\frac{1}{4}$

(D) None of these

Solution :

Given numbers are 1, 2, 3 and 4. Possibilities for unit's place digit (either 1 or 3) = 2

Possibilities for ten's place digit = 3

Possibilities for hundred's place digit = 2

Possibilities for thousand's place digit = 1

∴ Number of favourable outcomes

$= 2 \times 3 \times 2 \times 1 = 12$

Number of numbers formed by 1, 2, 3, 4 (without repetition) = 4!

∴ Required probability

$= \frac{12}{4 \times 3 \times 2} = \frac{1}{2}$

Correct Answer: D

Question 175 : Which of the following functions T from R into R are linear transformation.

(i) T ab = (1 + a, b) (ii) T a, b = (b, a)

(iii) T(a, b) = (a + b, a)

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (i) and (iii)

(D) None of these

Solution :

I. $(a, b) = (1 + a, b)$

Let $\alpha = (a_1, b_1), \beta = (a_2, b_2) \in V_2$ ( )

Then $(\alpha) = a_1, b = (1 + a_1, b_1)$

$\beta = a_2, b_2 = (1 + a_2, b_2)$

Also, let a, b ∈. Then $a\alpha + b\beta \in$ and

$(a\alpha + b\beta) = a(a_1, b_1) + b(a_2, b_2)$

$= (aa_1 + ba_2, ab_1 + bb_2)$

$= 1(aa_1 + ba_2, ab_1 + bb_2)$ .....(i)

Also $a(\alpha) + b(\beta)$

$= a\ a_1, b_1 + b(a_2, b_2)$

$= a(1 + a_1, b_1) + b(1 + a_2, b_2)$

$= a(a + b + aa_1 + ba_2, ab_1 + bb_2)$ .....(ii)

From eqs. (i) and (ii) we conclude that

$a\alpha + b\beta \neq a \quad (\alpha) + b \quad (\beta)$

∴ T is not a linear tranformation.

II. $a, b = (b, a)$

Let $a = (a_1, b_1), \beta = (a_2, b_2) \in V_2$ ( )

Then $\alpha = a_1b_1 = (b_1, a_1)$

$\beta = a_1, b_2 = (b_2, a_2)$

Also let a, b ∈. Then $a\alpha + b\beta \in V_2$ ( )

and $a + b\beta = a\ \ a\ \ b + b(a_2, b_2)$

$= aa + ba_2ab + bb_2$

$= a\ \ a_1, b_1 + b\ \ \ a_2, b_2$

∴ T is a linear transformation.

III. $a, b = (a + b, a)$

Let $\alpha = (a_1, b_1), \beta = (a_2, b_2) \in V_2$ ( )

Then, $\alpha = (a_1b_1) = (a_1 + b_1, a_1)$

$\beta = (a_2, b_2) = (a_2 + b_2, a_2)$

Also let a, b ∈. Then $aa + bb \in V_2$( )

and $aa + bb = a(a_1, b_1) + (a_2, b_2)$

$= aa_1 + ba_2 + ab_1 + bb_2$

$= [a(a_1 + b_1, a_1) + b(a_2 + b_2, a_2)]$

$= aT(\alpha) + bT(\beta)$

∴ T is a linear transformation.

Correct Answer: B

Consider the linear transformation,
$T : R^4 \to R^4$ given by
$T(x, y, z, u) = (x, y, 0, 0), \forall (x, y, z, u) \in R^4$.

Question 176 : Then, which one of the following is corret?

(A) Rank of T > Nullity of T

(B) Nullity of T > Rank of T

(C) Rank of T = Nullity of T = 3

(D) Rank of T = Nullity of T = 2

Q {(0, 0, 1, 0), (0, 0, 0, 1)} is linearly independent
and spanker (T).
∴ Nullity of T = 2
∴ Range of T = 2
[Q dim R^4 = nullity of T = rank of T]

Solution :

Correct Answer: D

Question 177 : Let $T : R_3 \to R^3$ be a linear transformation given by T(x, y, z) = (x, y, 0). Then, the null space is generated by which one of the following?

(A) (0, 0, 1)

(B) (0, 1, 0)

(C) (1, 0, 0)

(D) None of these

If $(x, y, z) \in Ker(T)$.
Q $T(x, y, z) = (0, 0, 0)$
$\Rightarrow (x, y, 0) = (0, 0, 0)$
Hence, $(0, 0, z) \in Ker(T)$
Null space is generated by (0, 0, 1)

Solution :

Correct Answer: A

Question 178 : The integral $\int_0^\infty \sin x \, dx$

(A) exists

(B) exists and equal to zero

(C) exists and equal to1

(D) does not exist

Solution : We have, $\int_0^\infty \sin x \, dx = \lim_{\varepsilon \to \infty} \int_0^\varepsilon \sin x \, dx$

$= \lim_{\varepsilon \to \infty} (1 - \cos\varepsilon)$

Hence, the improper integral does not exist, since $\cos\varepsilon$ has no limit, when $\varepsilon \to \infty$.

Correct Answer: D

Consider the improper integral

$$I_1 = \int_1^\infty \frac{dx}{x\sqrt{x^2+1}} \text{ and } I_2 = \int_0^\infty e^{-x^2} dx$$

Question 179 : Then

(A) I_1 is convergent but I_2 is divergent

(B) I_2 is divergent but I_2 is convergent

(C) Both I_1 and I_2 are convergent

(D) Neither I_1 nor I_2 is convergent

Solution :

$I_1 \Rightarrow$ Let $f(x) = \dfrac{1}{x\sqrt{x^2+1}}$

and $g(x) = \dfrac{1}{x^2}$

Hence, $\lim\limits_{x\to\infty} \dfrac{f(x)}{g(x)} = \lim\limits_{x\to\infty} \dfrac{x^2}{x\sqrt{x^2+1}} = 1 \neq 0$

But the integral $\int_1^\infty \dfrac{dx}{x^2}$ is convergent.

Hence, $I_1 = \int_1^\infty \dfrac{dx}{x\sqrt{x^2+1}}$ is convergent.

$I_2 \Rightarrow$ Since, 0 is not a point of infinite discontinuity and so, we have to examine convergence at ∞ only.

We know that, $e^{x^2} > x^2, \forall x \in R$

$\Rightarrow e^{-x^2} < \dfrac{1}{x^2}, \forall x \in R$

But $\int_1^\infty \dfrac{1}{x^2} dx$ is convergent.

Hence, $\int_1^\infty e^{-x^2} dx$ is convergent

Correct Answer: A

Let f: $(1, \infty) \to (2, \infty)$ be a differentiable function such that $f(1) = 2$.

If $6\int_1^x f(t)dt = 3xf(x) - x^3, \forall x \geq 1$, then the value of

Question 180 : f(2) is

(A) –8/3

(B) 8/3

(C) ZERO

(D) 3/8

Solution : Using Newton-Leibnitz formula,

$6f(x).1 - 0 = 3f(x) = 3xf'(x) - 3x^2$

$\Rightarrow f'(x) - \frac{1}{x}f(x) = x$

$\Rightarrow \frac{f'(x) - f(x)}{x^2} = 1$

$\Rightarrow \frac{xf'(x) - f(x)}{x^2} = 1$

$\Rightarrow \frac{d}{dx}\left\{\frac{f(x)}{x}\right\} = 1$

$\Rightarrow \frac{f(x)}{x} = x + C \quad \left[Q\ f(x) = \frac{1}{3}\right]$

$\Rightarrow \frac{1}{3} = 1 + C$

$\Rightarrow C = -\frac{2}{3}$

$\therefore f(x) = x^2 - \frac{2}{3}x$

$\Rightarrow f(2) = 4 - \frac{4}{3} = \frac{8}{3}$

Correct Answer: B