DU MA MSc Statistics

Topic:- STATS MA

1) Consider a Latin Square Design with 5 treatments, 5 rows and 5 columns. The observation corresponding to the third treatment in second row and third column is missing. The mean sum of squares due to error is computed as 11. The standard error of difference between the estimated treatment means of the third and fifth treatment is[Question ID = 9678]

1. 5.32 [Option ID = 38709]
2. 2.31 [Option ID = 38710]
3. 6.93 [Option ID = 38711]
4. 1.95 [Option ID = 38712]

2) Which among the following designs provide the maximum degrees of freedom for estimation of the error variance?[Question ID = 9679]

1. Completely Randomized Design [Option ID = 38713]
2. Randomized Block Design [Option ID = 38714]
3. Latin Square Design [Option ID = 38715]
4. Latin Square Design with one missing observation [Option ID = 38716]

3) Which among the following principles of experimental designs given by R.A. Fisher ensures that estimate of the experimental error in an experimental design is valid?[Question ID = 9680]

1. Replication and local control [Option ID = 38717]
2. Replication, randomization and local control [Option ID = 38718]
3. Replication and randomization [Option ID = 38719]
4. Randomization and local control [Option ID = 38720]

4) Consider a 2^5 factorial experiment. The total number of factorial effects that can be studied in this experiment are[Question ID = 9681]

1. 32 [Option ID = 38721]
2. 30 [Option ID = 38722]
3. 16 [Option ID = 38723]
4. 31 [Option ID = 38724]

5) The following is the key block from a 2^4 factorial experiment in two blocks. {1 b ac ad cd abd abc bcd} The confounded effect is[Question ID = 9682]

1. ACD [Option ID = 38725]
2. ABC [Option ID = 38726]
3. BCD [Option ID = 38727]
4. ABD [Option ID = 38728]

6) Which of the following statement/statements regarding concomitant variables for ANACOVA is/are not correct? A. The concomitant variable must necessarily be measurable B. The concomitant need not necessarily be measurable C. ANACOVA is a combination of ANOVA and Regression Analysis D. The concomitant variable can be observed and controlled by the experimenter[Question ID = 9683]

1. A only [Option ID = 38729]
2. B and D only [Option ID = 38730]
3. D only [Option ID = 38731]
4. A and D only [Option ID = 38732]

7) Rank of the matrix A =

$$\begin{pmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{pmatrix}$$

where a, b, c are real and all different from each other such that a+b+c = 0 is:[Question ID = 9684]

1. 1 [Option ID = 38733]
2. 2 [Option ID = 38734]
3. 3 [Option ID = 38735]
4. 4 [Option ID = 38736]

8) Consider the following system of linear equations:

$\lambda x + y + z = 1$

$x + \lambda y + z = \lambda$

$x + y + \lambda z = \lambda^2$

This system has a unique solution if

[Question ID = 9685]

1. $\lambda = -2$ and $\lambda = 1$

   [Option ID = 38737]
2. $\lambda \neq -2$ and $\lambda \neq 1$

   [Option ID = 38738]
3. $\lambda \neq -2$ and $\lambda = 1$

   [Option ID = 38739]
4. $\lambda = -2$ and $\lambda \neq 1$

   [Option ID = 38740]

9) For the matrix

$$\begin{pmatrix} 1 & 4 & -3 \\ 0 & 3 & 1 \\ 0 & 2 & -1 \end{pmatrix}$$

a polynomial having the matrix as a root is

[Question ID = 9686]

1. $(t+1)(t^2 - 2t - 5)$

   [Option ID = 38741]
2. $(t-1)(t^2 - 2t + 5)$

   [Option ID = 38742]
3. $(t-1)(t^2 - 2t - 5)$

   [Option ID = 38743]
4. $(t+1)(t^2 + 2t - 5)$

   [Option ID = 38744]

10) The vector space V is said to be the direct sum of its sub spaces U and W if and only if the following is true:

[Question ID = 9687]

1. $V = U + W$ and $U \cap W \neq \{0\}$

   [Option ID = 38745]
2. Only $V = U + W$

   [Option ID = 38746]
3. Only $U \cap W = \{0\}$

   [Option ID = 38747]
4. $V = U + W$ and $U \cap W = \{0\}$

[Option ID = 38748]

11) Which of the following statements about the mean and mode of the F distribution is correct?[Question ID = 9688]

1. Mean is less than unity and mode is greater than unity [Option ID = 38749]
2. Mean is less than unity and mode is greater than zero [Option ID = 38750]
3. Mean is greater than unity and mode is less than unity [Option ID = 38751]
4. Mean of the distribution is less than the mode of the distribution [Option ID = 38752]

12) The p value of a significance test for population proportion is 0.08. To test a null hypothesis against a one sided alternative hypothesis, what will be the decisions regarding the null hypothesis at $\alpha = 0.10$ and $\alpha = 0.01$ respectively.[Question ID = 9689]

1. Accept, Reject [Option ID = 38753]
2. Reject, Accept [Option ID = 38754]
3. Accept, Accept [Option ID = 38755]
4. Reject, Reject [Option ID = 38756]

13) For any random variable X, having a finite mean and a finite standard deviation, at least what percentage of observations are expected to lie within two standard deviations from the mean?[Question ID = 9690]

1. 75% [Option ID = 38757]
2. 50% [Option ID = 38758]
3. 89% [Option ID = 38759]
4. 95.5% [Option ID = 38760]

14) A random variable X ~ Binomial (5, p) such that P(X=2) = 2 P(X= 3). The value of p is[Question ID = 9691]

1. $\frac{3}{4}$

   [Option ID = 38761]
2. $\frac{1}{4}$

   [Option ID = 38762]
3. $\frac{1}{3}$

   [Option ID = 38763]
4. $\frac{2}{3}$

   [Option ID = 38764]

15) If we draw a sample of size 5 from a population of 50 units through simple random sampling without replacement, the finite population correction factor is:[Question ID = 9692]

1. 0.918 [Option ID = 38765]
2. 0.165 [Option ID = 38766]
3. 10 [Option ID = 38767]
4. 0.833 [Option ID = 38768]

16) Estimation of population parameters based on systematic sampling will be biased if[Question ID = 9693]

1. The units are arranged in a row. [Option ID = 38769]
2. The units situated at equal intervals are correlated. [Option ID = 38770]
3. The units situated at equal intervals are not correlated [Option ID = 38771]
4. There are no periodic features in the units [Option ID = 38772]

17) Circular systematic sampling can be used (Note: n is the sample size and N is the population size).[Question ID = 9694]

1. Only when N/n is an integer [Option ID = 38773]
2. Even when N/n is not an integer [Option ID = 38774]
3. Only when n/N is an integer [Option ID = 38775]
4. Even when n/N is not an integer [Option ID = 38776]

18) The probability of a simple random sample of size 50 being drawn without replacement out of 200 population units is:[Question ID = 9695]

1. $\frac{1}{200}$

   [Option ID = 38777]
2. $\frac{50}{200}$

   [Option ID = 38778]
3. $\frac{1}{50}$

   [Option ID = 38779]
4. $\frac{1}{\binom{200}{50}}$

   [Option ID = 38780]

19) For optimum allocation under stratified sampling, consider fixed total population and sample sizes as N and n respectively. S_i^2 represents the population mean square of the i^{th} stratum. The optimum sample size n_i for the i^{th} stratum (i = 1, , k) is:[Question ID = 9696]

1. $\frac{nN_iS_i}{\sum_{i=1}^{k} N_iS_i^2}$

   [Option ID = 38781]
2. $\frac{N_iS_i}{\sum_{i=1}^{k} N_iS_i}$

   [Option ID = 38782]
3. $\frac{nN_i}{\sum_{i=1}^{k} N_iS_i}$

   [Option ID = 38783]
4. $\frac{nN_iS_i}{\sum_{i=1}^{k} N_iS_i}$

   [Option ID = 38784]

20) A population of size 960 units is divided into two strata of sizes N_1 and N_2 respectively. A sample of size 30 is selected from the first strata and 60 from the second strata by proportional allocation. Strata sizes N_1 and N_2 are respectively[Question ID = 9697]

1. (300, 660) [Option ID = 38785]
2. (400, 560) [Option ID = 38786]
3. (320, 640) [Option ID = 38787]
4. (660, 300) [Option ID = 38788]

21) Let T_n be a sequence of estimators based on a random sample of size n from a distribution with θ as an unknown parameter. Which of the following statements is/ are always TRUE?

A. If T_n converges in probability to θ, T_n is a consistent estimator of θ.

B. If T_n converges almost surely to θ, T_n is a consistent estimator of θ.

C. If T_n is a consistent estimator of θ, T_n converges in probability to θ.

D. If T_n is a consistent estimator of θ, T_n converges almost surely to θ.

Choose the correct answer from the options given below:

[Question ID = 9698]

1. A only

   [Option ID = 38789]
2. A and B only

   [Option ID = 38790]
3. A and C only

[Option ID = 38791]

4. A, B, and C only

[Option ID = 38792]

22) Which of the following statements is NOT TRUE about the Cramer-Rao inequality?[Question ID = 9699]

1. It holds true for an unbiased estimator based on independently and identically distributed observations only. [Option ID = 38793]
2. It uses the Cauchy-Schwarz inequality. [Option ID = 38794]
3. It gives lower bound for variance of only unbiased estimators of an unknown parameter. [Option ID = 38795]
4. It is not valid for estimation of θ based on a random sample from Uniform(0, θ) distribution. [Option ID = 38796]

23) Let $X_1, X_2, X_3, \ldots, X_n$ be independently and identically distributed random variables following Bernoulli distribution with probability of success θ (unknown parameter). Based on observations on these variables, the MVUE of the parametric function

$$\gamma(\theta) = \theta(1-\theta)$$

is:[Question ID = 9700]

1. $\frac{\sum x_i (n - \sum x_i)}{n(n-1)}$

[Option ID = 38797]

2. $\frac{\bar{x}(n-\bar{x})}{n(n-1)}$

[Option ID = 38798]

3. $\frac{\bar{x}(1-\bar{x})}{(n-1)}$

[Option ID = 38799]

4. $\bar{x}(1-\bar{x})$

[Option ID = 38800]

24) Let $X_1, X_2, X_3, \ldots, X_n$ be independent random variables with following probability distribution functions.

$$f(x_i;\theta) = \frac{1}{2i\theta};\ -i(\theta-1) < x_i < i(\theta+1);\ \theta > 0$$

Which of the following is a two-dimensional sufficient statistic for θ?

[Question ID = 9701]

1. $\left(\frac{min_i(X_i)}{i}, \quad \frac{max_i(X_i)}{i}\right)$

[Option ID = 38801]

2. $(min_i(X_i), max_i(X_i))$

[Option ID = 38802]

3. $\left(\frac{min_i(X_i)}{i} + 1, \quad \frac{max_i(X_i)}{i} - 1\right)$

[Option ID = 38803]

4. $\left(min_i\left(\frac{X_i}{i}\right), \quad max_i\left(\frac{X_i}{i}\right)\right)$

[Option ID = 38804]

25) A random variable X takes the values 0, 1, 2 according to one of the following distributions.

Distribution	P(X = 0)	P(X = 1)	P(X = 2)	Parameter space
Distribution 1	θ	3θ	$1-4\theta$	$0 < \theta < 1/4$
Distribution 2	θ	θ^2	$1-\theta-\theta^2$	$0 < \theta < 1/2$

Which of the following statements is correct about the completeness of the two families of distributions?

[Question ID = 9702]

1. Both families of distributions are complete.

[Option ID = 38805]

2. Family of Distribution 1 is not complete, but that of Distribution 2 is complete.

[Option ID = 38806]

3. Family of Distribution 1 is complete, but that of Distribution 2 is not complete.

[Option ID = 38807]

4. Neither of the two families of distributions is complete.

[Option ID = 38808]

26) Which of the following is/ are general property/ properties of Maximum Likelihood Estimators (MLEs)?

A. If $\hat{\theta}$ is the MLE of θ, and $g(\theta)$ is a continuous function of θ, then $g(\hat{\theta})$ is the MLE of $g(\theta)$.

B. A consistent MLE is always unique.

C. MLEs, if they exist, are functions of sufficient statistic.

D. MLEs are always unbiased.

Choose the ***correct*** answer from the options given below:

[Question ID = 9703]

1. B only [Option ID = 38809]
2. A and B only [Option ID = 38810]
3. B and C only [Option ID = 38811]
4. C and D only [Option ID = 38812]

27) Consider $X_1, X_2, X_3, \ldots, X_n$ to be a random sample from a distribution with the following p.d.f,

$$f(x;\theta) = \begin{cases} \frac{1}{2}\exp[-(\theta - x)]\ ; if\ x < \theta \\ \frac{1}{2}\exp[-(x-\theta)]\ ; if\ x \geq \theta \end{cases}$$

Which of the following is the Maximum Likelihood Estimate of θ?[Question ID = 9704]

1. $\hat{X}$ (Sample Median)

[Option ID = 38813]

2. $X_{(1)}$ (The first-order statistic) [Option ID = 38814]
3. $\bar{X}$ (Sample Mean)

[Option ID = 38815]

4. $X_{(n)}$ (The n-th order statistic) [Option ID = 38816]

28)

Suppose that we are constructing two hypothesis tests with the following hypotheses for the parameters of a Normal distribution with mean μ and variance σ^2 (both parameters unknown).

Test 1:	Test 2:
Null- $H_{01}: \mu = \mu_0, \sigma^2 = \sigma_0^2$	Null- $H_{02}: \mu = \mu_0$
Alternative- $H_{11}: \mu > \mu_0, \sigma^2 > \sigma_0^2$	Alternative- $H_{12}: \mu = \mu_1$

Which of the following statements is TRUE?

[Question ID = 9705]

1. Test 1: Simple Null vs. Composite Alternative Test 2: Composite Null vs. Composite Alternative

   [Option ID = 38817]
2. Test 1: Simple Null vs. Composite Alternative Test 2: Simple Null vs. Simple Alternative

   [Option ID = 38818]
3. Test 1: Simple Null vs. Simple Alternative Test 2: Composite Null vs. Composite Alternative

   [Option ID = 38819]
4. Test 1: Composite Null vs. Composite Alternative Test 2: Simple Null vs. Simple Alternative

   [Option ID = 38820]

29)

Let $X_1, X_2, X_3, \ldots, X_n$ be independent Normally distributed random variables such that , $X_i \sim N(\alpha_i\theta, \alpha_i\sigma^2)$, **where α_i and σ are known positive numbers.** We want to construct a Uniformly Most Powerful (UMP test for testing the null hypothesis, $H_0: \theta = \theta_0$ against the alternative, $H_1: \theta = \theta_1 (< \theta_0)$.

Using Neyman-Pearson Lemma, the UMP critical region is coming out to be of the form $\bar{x} < k$, where k is such that the size of the critical region is α. What is the Power of the test?

{Notations used: $Z \sim N(0,1)$, $\bar{\alpha} = \frac{\sum \alpha_i}{n}$, $P[Z > z_\alpha] = \alpha$}

[Question ID = 9706]

1. $P\left[Z > \frac{(\theta_0 - \theta_1)\bar{\alpha}}{\sigma\sqrt{\bar{\alpha}/n}} - z_\alpha\right]$

   [Option ID = 38821]
2. $P\left[Z < \theta_0\bar{\alpha} - z_\alpha\sigma\sqrt{\frac{\bar{\alpha}}{n}}\right]$

   [Option ID = 38822]
3. $P\left[Z < \frac{(\theta_0 - \theta_1)\bar{\alpha}}{\sigma\sqrt{\bar{\alpha}/n}} - z_\alpha\right]$

   [Option ID = 38823]
4. $P\left[Z > (\theta_0 - \theta_1)\bar{\alpha} - z_\alpha\sigma\sqrt{\frac{\bar{\alpha}}{n}}\right]$

   [Option ID = 38824]

30) Let $(x_1, x_2, \ldots, x_n)$ be a random sample from a population with two unknown parameters, μ and θ. Suppose that we want to test the null hypothesis, : $H_0: \mu = \mu_0$ against the alternative, : $H_1: \mu > \mu_0$ using Likelihood Ratio Test. If λ is the likelihood ratio, which of the following statements is/ are **TRUE**:

A. $\lambda \geq 1$

B. $Asymptotically, -2log_e\lambda \sim \chi^2_{(1)}$ i.e., for large sample size it follows chi-square distribution with 1 degree of freedom.

C. $Asymptotically, -2log_e\lambda \sim \chi^2_{(2)}$ i.e., for large sample size it follows chi-square distribution with 2 degrees of freedom.

D. If $U = \phi(\lambda)$ is a monotonically increasing (or decreasing) function of λ, the likelihood ratio test based on U is equivalent to the likelihood ratio test based on λ.

Choose the ***correct*** answer from the options given below:

[Question ID = 9707]

1. C only

   [Option ID = 38825]
2. B and D only

   [Option ID = 38826]
3. C and D only

   [Option ID = 38827]
4. A and B only

   [Option ID = 38828]

31) Which of the following statement is NOT TRUE about the Wilcoxon-Mann-Whitney test?[Question ID = 9708]

1. It can be applied to independent random samples not conforming to Normal distribution. [Option ID = 38829]
2. It can be applied to samples containing ordered categorical data. [Option ID = 38830]
3. It can be considered as a non-parametric alternative to the paired-t test, when the assumptions of t-test are not satisfied. [Option ID = 38831]
4. It is based on the idea of comparing the central tendencies of two samples. [Option ID = 38832]

32) Suppose that a random sample of size n is drawn from a population distribution with unknown median M. The hypothesis to be tested is, H_0: M = 7 against H_1: M ≠ 7 Which of the following non-parametric tests can be applied to test the hypothesis?[Question ID = 9709]

1. Wald-Wolfowitz runs test [Option ID = 38833]
2. Median test [Option ID = 38834]
3. Sign test [Option ID = 38835]
4. Wilcoxon-Mann-Whitney test [Option ID = 38836]

33) $\lim_{x \to +\infty} x^{1/x} = ?$

[Question ID = 9710]

1. 0 [Option ID = 38837]
2. 1 [Option ID = 38838]
3. $+\infty$

   [Option ID = 38839]
4. does not exist [Option ID = 38840]

34) Evaluate the value of

$\lim_{x \to 0} \frac{(1 - \cos x)\sin 4x}{x^3 \cos x}$

Choose the correct result from the following.

[Question ID = 9711]

1. 4

[Option ID = 38841]

2. 2

[Option ID = 38842]

3. 1

[Option ID = 38843]

4. 1/2

[Option ID = 38844]

35) Evaluate $\iint_R (2x - y^2)\,dx\,dy$ over the triangular region R enclosed between the lines $y = -x + 1$, $y = x + 1$, and $y = 3$. Choose the correct answer.

[Question ID = 9712]

1. $\frac{-68}{3}$

[Option ID = 38845]

2. 34

[Option ID = 38846]

3. $\frac{-34}{3}$

[Option ID = 38847]

4. $\frac{68}{3}$

[Option ID = 38848]

36) To sketch the graph of the equation,

$y = \frac{2x^2-8}{x^2-16}$

the essential properties of the function are evaluated. Which of the following is/ are TRUE for the given function?

A. The graph of the function is symmetric about x- axis.

B. The graph has vertical asymptotes at the points x = −4 and x = 4.

C. The graph has horizontal asymptote at y = 2.

D. The graph is decreasing to the left of x = 0, and increasing to the right of 0.

Choose the *correct* answer from the options given below:

[Question ID = 9713]

1. A and C only

[Option ID = 38849]

2. B and C only

[Option ID = 38850]

3. A and B only

[Option ID = 38851]

4. C and D only

[Option ID = 38852]

37) The weak law of large numbers is based on:[Question ID = 9714]

1. Convergence in distribution [Option ID = 38853]
2. Convergence almost surely [Option ID = 38854]
3. Convergence in probability [Option ID = 38855]
4. Convergence in mean square [Option ID = 38856]

38) The coefficient of variation of a standard normal variate is:[Question ID = 9715]

1. 0 [Option ID = 38857]
2. 1 [Option ID = 38858]
3. ∞ [Option ID = 38859]
4. Undefined [Option ID = 38860]

39) Let $X_1, X_2, X_3, \ldots, X_n$ be independent random variables following exponential distribution with mean λ. A consistent estimator for $e^{-\lambda}$ is:

[$\bar{X}$ is the sample mean]

[is the sample mean][Question ID = 9716]

1. $\bar{X}$

[Option ID = 38861]

2. $e^{-1/\bar{X}}$

[Option ID = 38862]

3. $e^{-\bar{X}}$

[Option ID = 38863]

4. $-\log_e \bar{X}$

[Option ID = 38864]

40) Compute

$\lim_{x \to \frac{\pi}{2}} \left(x - \frac{\pi}{2}\right) \tan x$

and choose the correct answer.[Question ID = 9717]

1. −1 [Option ID = 38865]
2. 1 [Option ID = 38866]
3. 0 [Option ID = 38867]
4. ∞

[Option ID = 38868]

41) Given below are two statements, one is labelled as Assertion (A) and the other is labelled as Reason (R)

A : For a positively skewed distribution, average of absolute deviations is minimum when deviations are taken about median.

R : For a positively skewed distribution, median is closer to first quartile and median < mean

In light of the above statements, choose the correct answer from the options given below

[Question ID = 9718]

1. Both A and R are true and R is the correct explanation of A

   [Option ID = 38869]
2. Both A and R are true but R is not the correct explanation of A

   [Option ID = 38870]
3. A is true but R is false

   [Option ID = 38871]
4. A is false but R is true

   [Option ID = 38872]

42) A Linear Regression (LR) model of Y on X was fitted using Ordinary Least Squares (OLS) method. The fiited model based on 20 observations is: Y=20+110X, with a R^2 value of 0.6. Then, which one of the following is the most likely to be accurate?[Question ID = 9719]

1. $\sum e_i = 90,\ where\ e_i\ is\ the\ i^{th}\ residual$

   [Option ID = 38873]
2. $\sum e_i = -90$

   [Option ID = 38874]
3. $\sum e_i^2 = 0$

   [Option ID = 38875]
4. $\sum e_i^2 > 0$

   [Option ID = 38876]

43) If MD and SD represent the mean absolute deviation about median and standard deviation of a continuous uniform distribution respectively, then which of the following options is true?[Question ID = 9720]

1. MD > SD [Option ID = 38877]
2. MD < sd> [Option ID = 38878]
3. MD = SD [Option ID = 38879]
4. No relationship exists between MD and SD [Option ID = 38880]

44) If μ and σ^2 are the mean and variance of a random variable X, then which of the following can act as a measure of kurtosis of

$Z = \frac{X-\mu}{\sigma}$

?[Question ID = 9721]

1. $V(Z^2) + 1$, where $V(Z^2)$ = Variance of random variable Z^2 [Option ID = 38881]
2. $V(Z^2)$ [Option ID = 38882]
3. $V(Z^2) - 1$ [Option ID = 38883]
4. $V(Z^2) + \sigma^2$ [Option ID = 38884]

45) A Linear Regression (LR) model of y on x was fitted using Ordinary Least Squares (OLS) method. The fiited model based on 38 observations is: y=9+6x. The correlation coefficient r_{xy} is 0.7 and

$\sum_{i=1}^{38}(x_i - \bar{x})^2 = 4.9$

. Then the the standard error of the estimate of the slope coefficeint is :[Question ID = 9722]

1. $\frac{\sqrt{51}}{7}$

   [Option ID = 38885]
2. $\sqrt{\frac{51}{7}}$

   [Option ID = 38886]
3. $\frac{7}{\sqrt{51}}$

   [Option ID = 38887]
4. $\frac{51}{49}$

   [Option ID = 38888]

46) Consider an initial value problem (IVP):

$\frac{dy}{dx} = 18xy^2;\quad y(1) = \frac{1}{9}$

Then, the solution of this IVP and its interval of validity, respectively, are given by[Question ID = 9723]

1. $y(x) = \frac{1}{9(x^2-2)};\quad -\infty < x < \sqrt{2}$

   [Option ID = 38889]
2. $y(x) = \frac{1}{9(2-x^2)};\quad -\infty < x < \sqrt{2}$

   [Option ID = 38890]
3. $y(x) = \frac{1}{9(x^2-2)};\quad -\sqrt{2} < x < \sqrt{2}$

   [Option ID = 38891]
4. $y(x) = \frac{1}{9(2-x^2)};\quad -\sqrt{2} < x < \sqrt{2}$

   [Option ID = 38892]

47) The general and singular solutions of

$9\left(\frac{dy}{dx}\right)^2 (2-y)^2 = 4(3-y)$

are given by [Question ID = 9724]

1. $(x+c)^2 = y^2(3-y)$

   , c is an arbitrary constant and y = 3 is the singular solution. [Option ID = 38893]
2. $(x+c)^2 = y^2(3-y)$

   , c is an arbitrary constant and y = 2 is the singular solution. [Option ID = 38894]
3. $(x+c)^2 = (3-y)^2$

   , c is an arbitrary constant and y = 0 is a singular solution. [Option ID = 38895]
4. $(x+c)^2 = (3-y)^2$

   , c is an arbitrary constant and y = 2 is the singular solution. [Option ID = 38896]

48) Which one of the following is the solution of

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

[Question ID = 9725]

1. $c_1e^x + c_2e^{-x} + \frac{(x-3)e^x}{\ldots}$, $where\ c_1\ and\ c_2\ are\ arbitrary\ constants$

[Option ID = 38897]

2. $c_1e^x + c_2e^{-x} + 4(x-3)e^x$, *where c_1 and c_2 are arbitrary constants*

[Option ID = 38898]

3. $(c_1 + c_2x)e^{-x} + 4(x-3)e^x$, *where c_1 and c_2 are arbitrary constants*

[Option ID = 38899]

4. $(c_1 + c_2x)e^{-x} + \frac{(x-3)e^x}{4}$, *where c_1 and c_2 are arbitrary constants*

[Option ID = 38900]

49) Which one of the following options is the envelope of the general solution of $\left(\frac{dy}{dx}\right)^2 + x\frac{dy}{dx} - y = 0$

[Question ID = 9726]

1. $x^2 - 4y = 0$

[Option ID = 38901]

2. $2x^2 - y = 0$

[Option ID = 38902]

3. $x^2 + 4y = 0$

[Option ID = 38903]

4. $2x^2 + y = 0$

[Option ID = 38904]

50) Residents of a certain area are falling sick with either COVID or Common Flu. It is known that among sick individuals 50% have the common flu and rest are equally likely to have either symptomatic or asymptomatic covid. In the area-designated test center, people are getting tested for covid using Rapid Antigen test (RAT) kit, which is likely to detect positivity in case of higher covid viral load.

A study from this center found that: 60% have positive test results when they actually have symptomatic covid; 60% have negative test results when they actually have asymptomatic covid; and false positivity rate is found to be small enough to be ignored. Given that a person tests negative in the RAT, what would be the probability that the person actually has covid?

<span "="">

[Question ID = 9727]

1. $\frac{1}{4}$

[Option ID = 38905]

2. $\frac{1}{5}$

[Option ID = 38906]

3. $\frac{2}{3}$

[Option ID = 38907]

4. $\frac{1}{3}$

[Option ID = 38908]