2008 MA 52-68

EE24BTECH11051 - Prajwal

1) For two random variables X and Y , the regression lines are given by $Y = 5X - 15$ and $Y = 10X - 35$. Then regression coefficient of X and Y is

a) 0.1 b) 0.2 c) 5 d) 10

2) In an examination there are 80 questions each having four choices. Exactly one of these is choices is correct abd the other three are wrong. A student is awarded 1 mark for each correct answer, and -0.25 for each wrong answer. If a student ticks the answer of each question randomly, then the expected value of his/her total marks in the examination is

a) -15 b) 0 c) 5 d) 20

3) Let $X_1, X_2, \ldots, X_n$ be an random sample from uniform distribution on $[0, \theta]$. Then the maximum likelihood estimator (MLE) of θ based on the above random sample is

a) $\frac{2}{n} \sum X_i$
b) $\text{Min}\,[X_1, X_2, \ldots, X_n]$
c) $\frac{1}{n} \sum X_i$
d) $\text{Max}\,[X_1, X_2, \ldots, X_n]$

4) the cost matrix of a transportation problem is given by

1	2	3	4
4	3	2	0
0	2	2	1

(1)

The following are the values of the variables in a feasible solution.
$x_12 = 6, x_23 = 2, x_24 = 6, x_31 = 4, x_33 = 6$
then which of the following is correct?

a) The solution is degenerate and basic
b) The solution is non-degenerate and basic
c) The solution is degenerate and non-basic
d) The solution is non-degenerate and non-basic

5) the maximum value of $z = 3x_1 + x_2$ subject to $2x_1 + x_2 \leq 3, x_1 \leq 3$ and $x_1, x_2 \geq 0$ is

a) 0 b) 4 c) 6 d) 9

6) Consider the following maximizing problem $z = 2x_1 + 3x_2 - 4x_3 + x_4$ subject to

$$x_1 + x_2 + x_3 = 0 \tag{2}$$
$$x_1 + x_2 - x_3 = 0 = 10 \tag{3}$$
$$2x_1 + 3x_2 - 4x_3 + x_4 = 0 \tag{4}$$
$$x_1, x_2, x_3, x_4 \geq 0 \tag{5}$$

Then

a) $(1,0,1,4)$ is a basic feasible solution but $(2,0,0,4)$ is not
b) $(1,0,1,4)$ is not a basic feasible solution but $(2,0,0,4)$ is
c) neither $(1,0,1,4)$ nor $(2,0,0,4)$ is a basic feasible solution
d) both of $(1,0,1,4)$ and $(2,0,0,4)$ are basic feasible solutions

7) In the closed system of a simple harmonic motion of a pendulum, let H denote the Hamiltonian and E be the total energy. Then

a) H is a constant and $H = E$
b) H is a constant and $H \neq E$
c) H is not constant and $H = E$
d) H is not constant and $H \neq E$

8) The possible values fo α for which the variational problem

$$J\left[y(x)\right] = \int_0^1 \left(3y^2 + 2x^3 y'\right) dx, y(\alpha) = 1 \tag{6}$$

has extremals are

a) $-1, 0$
b) $0, 1$
c) $-1, 1$
d) $-1, 0, 1$

9) The functional $\int_0^1 \left(y'^2 + x^3\right) dx$,given $y(1) = 1$,achieves its

a) weak maximum on all its external
b) weak minimum on all its external
c) weak minimum on some,but not on all of its externals
d) weak maximum on some,but not on all of its externals

10) The integral equation

$$x(t) = \sin t + \lambda \int_0^t \left(s^2 t^3 + e^{s^2 + t^3}\right) x(s) ds, 0 \leq t \leq 1, \lambda \in \mathbb{R}, \lambda \neq 0 \tag{7}$$

a) all non-zero values of λ
b) no value of λ
c) only countably many positive values of λ
d) only countably many negative values of λ

11) The integral equation $x(t) - \int_0^1 \left[\cos t \sec s \; x(s)\right] ds = \sin ht, 0 \leq t \leq 1$,has

a) no solution
b) a unique solution
c) more than one but finitely many solution
d) infinitely many solutions

12) If $y_{i+1} = y_i + h\phi(f, x_i, y_i, h), i = 1, 2, \ldots$, where $\phi(f, x, y, h) = af(x, y) + bf(x + h, y + hf(x, y))$, is a second order accurate scheme to solve the initial value problem $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$, then a and b, respectively, are

a) $\frac{h}{2}, \frac{h}{2}$
b) $1, -1$
c) $\frac{1}{2}, \frac{1}{2}$
d) $h, -h$

13) If a quadrature formula $\frac{3}{2} f\left(-\frac{1}{3}\right) + K f\left(\frac{1}{3}\right) + \frac{1}{2} f(1)$,that approximates $\int_{-1}^1 (f(x)) dx$,is found to be exact for quadratic polynomials,then the value of K is

a) 2
b) 1
c) 0
d) -1

14) If $\begin{pmatrix} 1 & 4 & 3 \\ 2 & 7 & 9 \\ 5 & 8 & a \end{pmatrix} = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & -53 \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$, then the value of a is

a) -2 b) -1 c) 1 d) 2

15) Using the least squares method, if a curve $y = ax^2 + bx + c$ is fitted to the collinear data points $(-1,-3), (1,1), (3,5)$ and $(7,13)$,then the triplet (a,b,c) is equal to

a) $(-1,2,0)$ b) $(0,2,-1)$ c) $(2,-1,0)$ d) $(0,-1,2)$

16) A quadratic polynomial $p(x)$ is constructed by interploting the data points $(0,1), (1,e)$ and $2, e^2$.If $\sqrt{e}$ is approximated by using $p(x)$, then its approximately value is

a) $\frac{1}{8}\left(3 + 6e - e^2\right)$ b) $\frac{1}{8}\left(3 - 6e + e^2\right)$ c) $\frac{1}{8}\left(3 - 6e - e^2\right)$ d) $\frac{1}{8}\left(3 + 6e - e^2\right)$

17) The characteristics curve of $2yu_x + \left(2x + y^2\right)u_x = 0$ passing through $(0,0)$ is

a) $y^2 = 2(e^x + x - 1)$ b) $y^2 = 2(e^x - x + 1)$ c) $y^2 = 2(e^x - x - 1)$ d) $y^2 = 2(e^x + x + 1)$