AAP-003-006202 Seat No. _____

B. Sc. (B.I.) (Sem. II) (CBCS) Examination

April / May – 2016

BI-202-A : Mathematics & Statistics

(New Course)

Faculty Code : 003
Subject Code : 006202

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

SECTION - A

1 Choose the correct answers : **20**

(1) The mean value of $x^2 - 3x$ in (1,2) using Rolle's mean value theorem is _____.

(A) $\frac{3}{2}$ (B) 1

(C) 2 (D) $\frac{2}{3}$

(2) The minima of $x^3 - 12x$ is _____.

(A) 16 (B) -2

(C) 2 (D) -16

(3) If $f = x^2 + 3xy + y - 1$ then $\frac{\partial f}{\partial x}$ at $(4, -5)$ is _____.

(A) -7 (B) 13

(C) 2 (D) -14

(4) The expansion of $sinx$ is _____.

(A) $x + \frac{x^3}{3!} + \frac{x^5}{5!} + \ldots.$ (B) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \ldots.$

(C) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \ldots.$ (D) None of these

(5) Among the following which is always an increasing function for all $x>0$?

(A) $\cos x$ (B) $\log x$

(C) A and B both (D) None of these

(6) If $u = x^2 + 2xy^2 + x^3y + y^3 + 5$ then $\frac{\partial^2 u}{\partial x^2} =$

(A) 0 (B) $2 + 3x^2y$

(C) $2x + 2y^2 + 3x^2y$ (D) $2 + 6xy$

(7) The equation of a straight line with slope 5 and y-intercept -3 is _____.

(A) $y = -3x + 5$ (B) $y + 5 = -3x$

(C) $y + 3 = -5x$ (D) $y = 5x - 3$

(8) The angle between the two vectors $\bar{a}$ and $\bar{b}$ is 0, then,

(A) $\bar{a} \perp \bar{b}$ (B) $\bar{a} \parallel \bar{b}$

(C) $\bar{a} \circ \bar{b} = 0$ (D) None of these

(9) The mid point of the line joining the two points (3,4) and $(-2,-1)$ is _____.

(A) $\left(\frac{1}{2}, \frac{3}{2}\right)$ (B) $\left(\frac{-1}{2}, \frac{-1}{2}\right)$

(C) $(0,0)$ (D) $(-1,-1)$

(10) $[abc] =$ ..... if $a = (2,2,2), b = (-3,-3,-3)$ and $c = (-1,0,1)$.

(A) 0 (B) $2i + 2j + 3k$

(C) 2 (D) $-3i - 3j - 3k$

(11) $\int \left(x^9 + 9x^3\right) dx =$ _____

(A) $\frac{x^{10}}{10} + \frac{9x^4}{4} + c$ (B) $\frac{x^{10}}{10} - \frac{9x^2}{3} + c$

(C) $\frac{x^{10}}{10} + 27\frac{x^3}{4} + c$ (D) None of these

(12) $\int \frac{1}{x} dx =$ _____

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

(C) $\log x + c$ (D) $\frac{2}{x^2} + c$

(13) Coefficient of determination is denoted by _____.

(A) R (B) r

(C) c (D) d

(14) Range of r is _____.

(A) –1 to 1 (B) 0 to 1

(C) –2 to 2 (D) None of these

(15) The signs of correlation coefficient and regression coefficient are always _____.

(A) Different (B) Same

(C) Varying (D) None of these

(16) In usual notations, $P\left(A - B\right) =$ _____ .

(A) $P(A) - P(B)$ (B) $P(B) - P(A)$

(C) $P(A) - P\left(A \cap B\right)$ (D) None of these

(17) If A and B are mutually exclusive events then $P\left(A \cup B\right) =$ _____

(A) $P(A) + P(B) - 1$ (B) $1 - P\left(A \cup B\right)$

(C) $P(A) - P(B)$ (D) $P(A) + P(B)$

(18) Mathematical expectation is nothing but the _____ of the data.

(A) Mode (B) Variance

(C) Mean (D) Probability

(19) The probability distribution of a randon variable x is as follows then value of P is _____.

x_i	0	1	2	3	4
$P(x_i)$	$1/6$	P	$1/4$	P	$1/6$

(A) $\frac{5}{24}$ (B) $\frac{2}{3}$

(C) $\frac{3}{4}$ (D) None of these

(20) For a probability distribution $\sum P(x_i) =$.

(A) 0 (B) -1

(C) 1 (D) None of these

SECTION - B

1 (a) Answr any three : **3×2=6**

(1) Find $\left(2\bar{a} - 3\bar{b}\right) \circ (3\bar{a} + \bar{b})$ where $\bar{a} = 2i - 3j + k$ and $\bar{b} = 4i - j - 2k$.

(2) Prove that $y = x - \frac{1}{x}$ is an increasing function of $\mathbb{R}$.

(3) Verify Lagrange's mean value theorom for the function $2x - x^2$ on $[0,2]$.

(4) Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if (i) $z = xy$ (ii) $z = \frac{x}{y}$.

(5) Show that the points (2,2), (2,4), (4,4) and (4,2) are the vertices of a square.

(6) Find (i) $\int \left(e^x + 2x + 1\right) dx$ (ii) $\int_0^4 (x+1) dx$

(b) Answer any three : **3×3=9**

(1) What would be the value of x when the distance between $(x,-4)$ and $(-8,2)$ be 10 ?

(2) Find $\int \frac{x^3}{x-1} dx$.

(3) Find the area of triangle whose vertices are $(1,5),(-1,3)$ and $(5,6)$.

(4) Find the ratio in which the point (2,7) divides the join of the points (1,5) and (3,9).

(5) Find the equation of straight line passing through the point (2,4) and making equal intercepts of opposite sign on the axes.

(6) Expand $\log x$ in terms of $x-1$.

(c) Answer any two **2×5=10**

(1) Let $A(-1,3)$ and $B(2,12)$ be two points in $\mathbb{R}^2$, find

(i) equation of the line AB

(ii) slope of the line AB

(iii) length of the line AB.

(2) Let $u = \sin(2x+3y)+\log(2x-y)$ find

$$\frac{\partial}{\partial y}\left(\frac{\partial u}{\partial x}\right) \text{ and } \frac{\partial}{\partial x}\left(\frac{\partial u}{\partial y}\right)$$

(3) Show that the function $f(x) = x^3 - 6x^2 + 9x - 8$ has a maximum value at x=1 and a minimum value at x=3. Also find these values.

(4) Find the scalar triple product and vector tripe product of the vectors $4i - j - 2k$.

(5) Integrate $\frac{1}{4+\sin x}$ with respect to x.

2 (a) Answer any three : **3×2=6**

(1) If A and B are two independent events and $P(A)=0.5,\ P(B)=0.2$ then find $P(A\cup B)$.

(2) Explain positive and negative correlation by scatter diagram method.

(3) If E(x)=2 then find the value of E($3x$+2)

(4) If the regression lines are $4x-5y+33=0$ and $-9y+20x-107=0$ then find x and y.

(5) If $P(A)=0.7, P(B)=0.6$ and $P(A\cap B)=0.56$, find $P(A'\cap B')$.

(6) Expand e^x in terms of $x-1$.

(b) Answer any three : **3×3=9**

(1) Two dice are tossed simultaneously then find the probability that sum of the number on two dice are (i) less than 6 (ii) divisible by 9.

(2) There are 3 defective things out 10. Three things are taken one after the other; find the probability that the three balls are defective for the selection (i) with replacement (ii) without replacemnet.

(3) The probability distribution of demand of a commodity is given below :

Demand(x)	5	6	7	8	9	10
Prob $P(x)$	0.05	0.1	0.3	0.4	0.1	0.05

Find the expected demand and its variance.

(4) Explain any five properties of regression coefficients.

(5) For a bivariate data $n^2-1=255$ and correlation coefficient is 0.8. Then find the range of correlation coefficient.

(6) Find $\int \frac{2x}{(x-1)(x-2)}dx$.

(c) Answer any two. **2×5=10**

(1) Find the regression lines from the following data and also estimate y for x=1 and x for y=4 :

X :	3	2	−1	6	4	−2	5	7
Y :	5	13	12	−1	2	20	0	−3

(2) Find the coefficient of rank correlation :

X :	28	27	26	35	39	42	39	37	32	22
Y :	40	42	38	49	40	50	38	44	45	36

(3) The proabability distribution of a random variable x is as follows :

X :	−3	−2	−1	0	1	2	3
$P(X)$:	0.05	P	0.30	0	0.30	0.5	P

Then find the value of P and also find E(x) and V(x).

(4) If for two events A and B,

$P(A) = 0.6, P(B') = 0.5, P(A \cap B) = 0.3$ then find

(i) $P(A \cup B)$ (ii) $P(A' \cap B')$ (iii) $P\left(A'/B'\right)$.

(5) If $\bar{a} = 2i + 2j - k, \bar{b} = 3i - j - k$ and $\bar{c} = i + 2j - 3k$ then show that $(\bar{a} \times \bar{b}) \times \bar{c}$ and $\bar{a} \times (\bar{b} \times \bar{c})$ are not the same.