Q.1 A) 1) c) uniform annuity (08)

2) a) 3200

3) a) positive

4) b) 30

5) a) less than zero

6) c) $-\frac{P}{D}\frac{dD}{dp}$

7) a) 11

8) b) Discounted value

9) a) Variables

10) b) arithmetic mean.

B) 1) True (07)

2) True

3) False

4) True

5) False

6) True

7) True

8) True

9) False

10) False

2. a) (08)

Accumulated value = 1,20,000 − 20,000 = 1,00,000

$$A = \frac{C}{i}\left[(1+i)^n - 1\right]$$

$$1,00,000 = \frac{C}{0.06}\left[(1+0.06)^5 - 1\right]$$

$$1,00,000 = \frac{C}{0.06}\left[1.3382 - 1\right]$$

$$1,00,000 = C\,(5.637) \quad \therefore C = 17,739.64.$$

Q.2 b) (P)

C I	f	
500-600	60	
600-700	120	← f_0
Modal class 700-800	150	← f_1
800-900	130	← f_2
900-1000	80	
1000-1100	40	

~~$Z = (l_2 - l_1)$~~ $l_1 = 700$, $l_2 = 800$

$$Z = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} (l_2 - l_1)$$

$$= 700 + \frac{150 - 120}{2(150) - 120 - 130} (800 - 700)$$

$$= 700 + \frac{30}{300 - 250} (800 - 700)$$

$$= 700 + \frac{30}{50} (100)$$

$$= 760.$$

OR

Q.2 p) $i = \frac{0.09}{12} = 0.0075$

P. 80000

n = 4.

$$P = \frac{EMI}{i} \left[1 - (1+i)^{-n}\right]$$

$$80000 = \frac{EMI}{0.0075} \left[1 - (1+0.0075)^{-4}\right]$$

$$80000 = \frac{EMI}{0.0075} (0.0294)$$

$$EMI = 20,376.4$$

Q.2 q)

C I	f	cf
20-30	50	50
30-40	75	125
Median class 40-50	100	225 ←
50-60	125	350
60-70	25	375
70-80	25	400
	400	

$l_1 = 40$, $l_2 = 50$, $N = 400$, $cf = 125$, $f = 100$

$$M = l_1 + \frac{\frac{N}{2} - cf}{f} (l_2 - l_1)$$

$$= 40 + \frac{\frac{400}{2} - 125}{100} (50 - 40)$$

$$= 40 + \frac{200 - 125}{100} (10)$$

$$= 40 + \frac{75}{100} (10)$$

$$M = 47.5$$

Q.2 q)

CI	f	cf
20-30	50	50
30-40	75	125 ←
40-50	100	225
50-60	125	350
60-70	25	375
70-80	25	400
	400	

$q_1 = \frac{400}{4} = 100$

$Q_1 = l_1 + \frac{q_1 - cf}{f}(l_2 - l_1)$

$= 30 + \frac{100-50}{75}(40-30)$

$= 30 + \frac{50}{75}(10)$

$= 36.67$

(07) 3

Q.3 p) $R = 30x - x^2 \quad C = 50 + 4x$ (08)

$P = R - C$

$P = 30x - x^2 - 50 - 4x$

Profit is maximum, when $\frac{dP}{dx} = 0$ & $\frac{d^2P}{dx^2} < 0$

$\frac{dP}{dx} = 30 - 2x - 4$

$0 = 26 - 2x$

$\therefore x = 13$

$\frac{d^2P}{dx^2} = -2$

$\left.\frac{d^2P}{dx^2}\right|_{x=13} = -2$

$\therefore$ Profit is max. at $x = 13$

$P_{max} = 26(13) - 13^2 - 50$

$= 119$

Q.3 a) i) $y = \dfrac{e^x + \log x}{x^3 - 4}$ (08) (5)

$$\frac{dy}{dx} = \frac{(x^3-4)\frac{d}{dx}(e^x+\log x) - (e^x+\log x)\frac{d}{dx}(x^3-4)}{(x^3-4)^2}$$

$$= \frac{(x^3-4)\left(e^x+\frac{1}{x}\right) - (e^x+\log x)(3x^2)}{(x^3-4)^2}$$

ii) $y = (5^5 + \log x)(x^5+5)$

$$\frac{dy}{dx} = (x^5+5)\frac{d}{dx}(5^5+\log x) + (5^5+\log x)\frac{d}{dx}(x^5+5)$$

$$= (x^5+5)\left(\frac{1}{x}\right) + (5^5+\log x)(5x^4)$$

Q.3 b) At Equilibrium point, (07)

$$D = S$$

$$2 - 0.2p = 0.2 + 0.7p$$

$$0.9p = 1.8$$

$$p = 2.$$

∴ Equilibrium price = 2.

At equilibrium $D = S = 2 - 0.2(2) = 2 - 0.4 = 1.6$.

3. a) ~~$P = R - C = 260 - 3x^2 - 500 - 30x = -3x^2 - 30x - 240$~~

~~$30x - x^2 - 50 + 4x = -x^2 + 26x - 50$~~

Profit is max. when $\frac{dP}{dx} = 0$ & $\frac{d^2P}{dx^2} < 0$.

$$\frac{dP}{dx} = -2x + 26 = 0$$

$$\therefore x = 13.$$

$$\frac{d^2P}{dx^2} = -2 < 0.$$

∴ Profit is max. when $x = 13$

$P_{max} = -13^2 + 26(13) - 50 = 119$

$P = R - C = 260 - 3x^2 + 500 + 30x$

$= -3x^2 + 30x + 760$

$$\frac{dP}{dx} = -6x + 30$$

$$\therefore x = 5$$

$$\frac{d^2P}{dx^2} = -6 < 0$$

∴ Profit is max. when $x = 5$

$P_{max} = -3(5)^2 + 30(5) + 760$

$= 835$

Q.3 q) (r) $A = P\left(1 + \frac{r}{m \times 100}\right)^{n \times m}$ (3)(07) (5)

$A = 40000\left(1 + \frac{4}{2 \times 100}\right)^{2 \times 2}$

$= 40000(1 + 0.02)^4$

$= 40000\ (1.02)^4$

$= 40000\ (1.0824)$

$= 43,297.28.$

(08)

Q.4 a)

X	Y	XY	X^2
5	32	160	25
6	25	150	36
9	30	270	81
8	34	272	64
3	39	117	9
31	160	969	215

$\bar{X} = \frac{\Sigma X}{n} = \frac{31}{5} = 6.2 \quad \bar{Y} = \frac{\Sigma Y}{n} = \frac{160}{5} = 32$

$$byx = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{n}}{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}$$

$$= \frac{969 - \frac{(31)(160)}{5}}{215 - \frac{(31)^2}{5}}$$

$$= \frac{969 - 992}{215 - 192.2} = \frac{-23}{22.8} = -1.0087.$$

$Y - \bar{Y} = byx\ (X - \bar{X})$

$Y - 32 = -1.0087(X - 6.2)$

$Y = 32 - 1.0087X + 6.254$

$Y = -1.0087X + 38.254.$

Q.4 b)

R1	R2	$\lvert d \rvert$	$\lvert d \rvert^2$
2	5	3	9
5	3	2	4
4	2	2	4
1	4	3	9
3	1	2	4
6	6	0	0
			30

(07) (6) (7)

$$R = \frac{1 - 6\Sigma d^2}{n(n^2-1)}$$

$$= 1 - \frac{6(30)}{6(6^2-1)}$$

$$= 1 - \frac{6(30)}{6(35)}$$

$$= 1 - \frac{30}{35}$$

$$= 1 - 0.857$$

$$= 0.14285$$

OR

Q.4 p)

X	Y	X^2	Y^2	XY
3	12	9	144	36
4	7	16	49	28
5	5	25	25	25
3	11	9	121	33
4	8	16	64	32
19	43	75	403	154

(08)

$$r = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{n}}{\sqrt{\Sigma x^2 - \frac{(\Sigma x)^2}{n}} \sqrt{\Sigma Y^2 - \frac{(\Sigma Y)^2}{n}}}$$

$$= \frac{154 - \frac{(19)(43)}{5}}{\sqrt{75 - \frac{(19)^2}{5}} \sqrt{403 - \frac{(43)^2}{5}}}$$

$$= \frac{154 - 163.4}{\sqrt{75 - 72.2} \sqrt{403 - 369.8}}$$

$$= \frac{-9.4}{(1.6733)(5.7619)} = -0.9749$$

Q.4 q). (R) (07)

CI	f	x	$u = \frac{x-65}{10}$	fu	fu^2
40-50	6	45	-2	-12	24
50-60	26	55	-1	-26	26
60-70	30	65	0	0	0
70-80	24	75	1	24	24
80-90	09	85	2	18	36
90-100	05	95	3	15	45
	110			19	155

$$\bar{u} = \frac{\Sigma fu}{\Sigma f} = \frac{19}{110} = 0.1727$$

$$\sigma_u = \sqrt{\frac{\Sigma fu^2}{\Sigma f} - \bar{u}^2} = \sqrt{\frac{155}{110} - (0.1727)^2}$$

$$= \sqrt{1.409 - 0.0298}$$

$$= \sqrt{1.3792}$$

$$= 1.17439$$

$$\sigma_x = c \cdot \sigma_u = 10(1.17439) = 11.7439$$

(8)

5 a) Requisites of good questionnaire. (08)

(i) The no. of questions should be as few as possible. (ii) question should be short, simple.
(iii) questions to be drafted are of objective type.
(iv) personal bias of an investigator is not reflected.
(v) Arrangement of questions should be carefully planned.
(vi) questionnaire should be neatly printed.

b) Requisites of good measure of dispersion (07)

(i) It should be easy to understand to calculate
(ii) rigidly defined (iii) based on All obsn
(iv) Capable for further Algebric treatment.
(v) Should have sampling stability.

OR

(T) Merits & Demerits of Arithmetic Mean.

(i) Merits (i) Easy to understand & Calculate
(ii) rigidly defined (iii) Based on All obsn
(iv) Capable for further Algebric treatment
(v) Better representative.

Demerits:- (i) If some values are not known, it cannot be calculated
(ii) It is a value may not be present in data
(iii) It may give absurd result
(iv) Affected by extreme values.

10.

2) Correlation & types of correlation

If there exist a relation betn pairs of variables (say x & y) such that change in one variable is accompanied by change in the other value. then we say that variable (x & y) are correlated.

Explanation of positive, Negative & NO Correlation

3) Function & its types :-

If there exists a relation between two variables x & y such that for every value of x in a given set A, we get a definate value of y in set B, then y is called a function of x.

Explanation of (1) Constant function 2) power function 3) polynomial function 4) quadratic function 5) linear function 6) Exponential fn.

4) Annuity & its types

A Series of payments made at successive intervals of time is called Annuity. When payments are equal amount, the annuity is called uniform Annuity. otherwise it may be called variable annuity.

The annuity which is payable forever is called perpetuity.

Ordinary Annuity :- fixed payment at the end of each period

Annuity due:- First payment at the beginning of first period. (13)

5) Limitations of statistics:-

(i) Statistical Methods can be applied to only quantitative data.

(ii) The Method can be applied to a group of observations and not a single observation

(iii) Results derived using statistical Methods are not Cent Percent accurate.

(iv) personal bias of an investigator may discredit the entire work.

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