

HALF YEARLY MODEL QUESTION PAPER - 1

11th Standard

Business Mathematics and Statistics - 1

Time : 02:30:00 Hrs

Total Mark : 90

20 x 1 = 20

Part -A

Choose the correct answer:

- 1) If A is a square matrix of order 3, then $|kA|$ is
(a) $k|A|$ (b) $-k|A|$ (c) $k^3|A|$ (d) $-k^3|A|$
- 2) The Inverse of matrix of $\begin{pmatrix} 3 & 1 \\ 5 & 2 \end{pmatrix}$ is
(a) $\begin{pmatrix} 2 & -1 \\ -5 & 3 \end{pmatrix}$ (b) $\begin{pmatrix} -2 & 5 \\ 1 & -3 \end{pmatrix}$ (c) $\begin{pmatrix} 3 & -1 \\ -5 & -3 \end{pmatrix}$ (d) $\begin{pmatrix} -3 & 5 \\ 1 & -2 \end{pmatrix}$
- 3) The value of $\begin{vmatrix} 5 & 5 & 5 \\ 4x & 4y & 4z \\ -3x & -3y & -3z \end{vmatrix}$ is
(a) 5 (b) 4 (c) 0 (d) -3
- 4) The possible out comes when a coin is tossed five times
(a) 2^5 (b) 5^2 (c) 10 (d) $\frac{5}{2}$
- 5) The middle term in the expansion of $(x + \frac{1}{x})^{10}$
(a) $10C_4(\frac{1}{x})$ (b) $10C_5$ (c) $10C_6$ (d) $10C_7x^4$
- 6) If m_1 and m_2 are the slopes of the pair of lines given by $ax^2 - 2hxy + by^2 = 0$, then the value of $m_1 + m_2$ is
(a) $2h/b$ (b) $-2h/b$ (c) $2h/a$ (d) $-2h/a$
- 7) In the equation of the circle $x^2 + y^2 = 16$ then y-intercept is (are)
(a) 4 (b) 16 (c) ± 4 (d) ± 16
- 8) The equation of directrix of the parabola $y^2 = -x$ is
(a) $4x + 1 = 0$ (b) $4x - 1 = 0$ (c) $x - 4 = 0$ (d) $x + 4 = 0$
- 9) The radian measure of $37^\circ 30'$ is
(a) $\frac{5\pi}{24}$ (b) $\frac{3\pi}{24}$ (c) $\frac{7\pi}{24}$ (d) $\frac{9\pi}{24}$
- 10) The value of $\sin(-420^\circ)$ is
(a) $\frac{\sqrt{3}}{2}$ (b) $-\frac{\sqrt{3}}{2}$ (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$
- 11) The graph of $f(x) = e^x$ is identical to that of
(a) $f(x) = a^x, a > 1$ (b) $f(x) = a^x, a < 1$ (c) $f(x) = a^x, 0 < a < 1$ (d) $y = ax + b, a \neq 0$
- 12) $\lim_{x \rightarrow \infty} \frac{\tan \theta}{\theta} =$
(a) 1 (b) ∞ (c) $-\infty$ (d) θ
- 13) If $y = x$ and $z = \frac{1}{x}$ then $\frac{dy}{dz} =$
(a) x^2 (b) 1 (c) $-x^2$ (d) $-\frac{1}{x^2}$
- 14) The maximum value of $f(x) = \sin x$ is
(a) 1 (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $-\frac{1}{\sqrt{2}}$
- 15) If $u = e^{x^2}$ then $\frac{\partial u}{\partial x}$ is equal to
(a) $2xe^{x^2}$ (b) e^{x^2} (c) $2e^{x^2}$ (d) 0

- 16) A man received a total dividend of Rs 25,000 at 10% dividend rate on a stock of face value Rs.100, then the number of shares purchased.
 (a) 3500 (b) 4500 (c) 2500 (d) 300
- 17) Rs 5000 is paid as perpetual annuity every year and the rate of C.I 10 %. Then present value P of immediate annuity is
 (a) Rs 60,000 (b) Rs 50,000 (c) Rs 10,000 (d) Rs 80,000
- 18) If 'a' is the annual payment, 'n' is the number of periods and 'i' is compound interest for Rs 1 then future amount of the annuity is
 (a) $A = \frac{a}{t}(1+t)(1+t)^n - 1$ (b) $A = \frac{a}{t}(1+t)^n - 1$ (c) $P = \frac{a}{t}$ (d) $P = \frac{a}{t}(1+t)[1 - (1+t)^{-n}]$
- 19) When an observation in the data is zero, then its geometric mean is
 (a) Negative (b) Positive (c) Zero (d) Cannot be calculated
- 20) Probability of an impossible event is
 (a) 1 (b) 0 (c) 0.2 (d) 0.5

Part - B

7 x 2 = 14

Answer the following (Any 7) Question No.29 is compulsory.

- 21) Find the minors and cofactors of all the elements of the following determinants.

$$\begin{bmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{bmatrix}$$

- 22) Evaluate the following using binomial theorem:
- $(101)^4$

- 23) Find the combined equation of the given straight lines whose separate equations are
- $2x+y-1=0$
- and
- $x+2y-5=0$
- .

- 24) Express the following as sum or difference

$$2\sin 2\theta \cos \theta$$

- 25) Express the following as sum or difference

$$\cos \frac{3A}{2} \cos \frac{5A}{2}$$

- 26) Find
- $\frac{dy}{dx}$
- if
- $x = a \cos \theta$
- ,
- $y = a \sin \theta$

- 27) A manufacturing company has a contract to supply 4000 units of an item per year at uniform rate. The storage cost per unit per year amounts to Rs 50 and the set up cost per production run is Rs 160. If the production run can be started instantaneously and shortages are not permitted, determine the number of units which should be produced per run to minimize the total cost.

- 28) If
- $z = (ax + b)(cy + d)$
- , then find
- $\frac{\partial z}{\partial x}$
- and
- $\frac{\partial z}{\partial y}$

- 29) Which is better investment? 20% stock at 140 (or) 10% stock at 70.

- 30) Let
- $P(A) = \frac{3}{5}$
- and
- $P(B) = \frac{1}{5}$
- . Find
- $P(A \cap B)$
- if A and B are independent events.

Part -C

7 x 3 = 21

Answer the following (Any 7) Question No. 33 is compulsory.

- 31) If
- $A = \begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$
- and
- $B = \begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$
- then, verify that
- $(AB)^{-1} = B^{-1}A^{-1}$

- 32) Resolve into partial fractions for the following:

$$\frac{x^2 - 6x + 2}{x^2(x+2)}$$

- 33) Find the Co-efficient of
- x^{11}
- in the expansion of
- $\left(x + \frac{2}{x^2}\right)^{17}$

- 34) Find the equation of tangent at the point
- $(-2, 5)$
- on the circle
- $x^2 + y^2 + 3x - 8y + 17 = 0$
- .

- 35) Prove that
- $\frac{\tan 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

- 36) Find
- $\frac{dy}{dx}$
- of the following functions:
- $x = a(\theta - \sin \theta)$
- ,
- $y = a(1 - \cos \theta)$

- 37) The production function for a commodity is
- $P = 10L + 0.1L^2 + 15K - 0.2K^2 + 2KL$
- where L is labour and K is Capital.

(i) Calculate the marginal products of two inputs when 10 units of each of labour and Capital are used

(ii) If 10 units of capital are used, what is the upper limit for use of labour which a rational producer will never exceed?

- 38) For the production function
- $P = 4L^{\frac{3}{4}}K^{\frac{1}{4}}$
- verify Euler's theorem

- 39) A person deposits Rs 4,000 in the beginning of every year. If the rate of compound interest is 14% then, find the amount after 10 years.
- $[(1.14)^{10} = 3.707]$

40) Calculate the Harmonic Mean of the following values:

1, 0.5, 10, 45.0, 175.0, 0.01, 4.0, 11.2

Part -D

7x5=35

Answer all the questions

41) a) Compute coefficient of quartile deviation from the following data

Marks	10	20	30	40	50	60
No. of Students	4	7	15	8	7	2

(OR)

b) Calculate the Mean deviation about median and its relative measure for the following data.

X	15	25	35	45	55	65	75	85
frequency	12	11	10	15	22	13	18	19

42) a) A person sells a 20% stock of face value Rs 10,000 at a premium of 42%. With the money obtained he buys a 15% stock at a discount of 22%. What is the change in his income if the brokerage paid is 2%.

(OR)

b) Vijay wants to invest Rs .27,000 in buying shares. The shares of the following companies are available to him. Rs 100 shares of company A at par value ; Rs 100 shares of company B at a premium of Rs 25. Rs 100 shares of company C at a discount of Rs 10. Rs 50 shares of company D at a premium of 20%. Find how many shares will he get if he buys shares of company (i) A (ii) B (iii) C (iv) D

43) a) For the cost function $C = 2x \left(\frac{x+5}{x+2} \right) + 7$, prove that marginal cost (MC) falls continuously as the output x increases

(OR)

b) The demand for a commodity x is $q = 5 - 2p_1 + p_2 - p_1^2 p_2$. Find the partial elasticities $\frac{Eq}{EP_1}$ and $\frac{Eq}{EP_2}$ when $p_1=3$ and $p_2=7$

44) a) Examine the following functions for continuity at indicated points

$$f(x) = \begin{cases} \frac{x^2-4}{x-4}, & \text{if } x \neq 2 \\ 0, & \text{if } x = 2 \end{cases} \text{ at } x = 2$$

(OR)

b) A group of students wish to charter a bus for an educational tour which can accommodate atmost 50 students. The bus company requires at least 35 students for that trip. The bus company charges Rs 200 per student up to the strength of 45. For more than 45 students, company charges each student Rs 200 less $\frac{1}{5}$ times the number more than 45. Consider the number of students who participates the tour as a function, find the total cost and its domain.

45) a) Solve by using matrix inversion method:

$$3x-2y+3z=8; 2x+y-z=1; 4x-3y+2z=4$$

(OR)

b) The cost of 4 kg onion, 3 kg wheat and 2 kg rice is Rs.320. The cost of 2kg onion, 4 kg wheat and 6 kg rice is Rs.560. The cost of 6 kg onion, 2 kg wheat and 3 kg rice is `380. Find the cost of each item per kg by matrix inversion method.

46) a) Show by the principle of mathematical induction that 2^{3n-1} is a divisible by 7, for all $n \in \mathbb{N}$.

(OR)

b) Show that the pair of straight lines $4x^2 + 12xy + 9y^2 - 6x - 9y + 2 = 0$ represents two parallel straight lines and also find the separate equations of the straight lines..

47) a) Find the co-ordinated of the focus, vertex, equation of the directrix, axis and the length of latus rectum of the parabola

i) $y^2 = 20x$

ii) $x^2 = 8y$

iii) $x^2 = -16y$

(OR)

b) If $\sin A = \frac{3}{5}$ where $\angle A \in (0, \frac{\pi}{2})$ and $\cos B = \frac{-12}{13}$, $\angle B \in (\frac{\pi}{2}, \pi)$, find the values of the following $\sin(A - B)$
