XII Std

MODEL QUESTION PAPER - 2

Time : 2.30 Hrs. Business Mathematics Max. Marks : 90

Part - A (20 × 1 = 20)

Answer all the questions:

Choose the correct answer:

1. Of the conditions of Hawkins-Simon, which of the following is true
   a) The entires in the principal diagonal of I-B are positive numbers
   b) The entries in the principal diagonal of I-B are negative numbers
   c) The entries in the principal diagonal of I-B may be positive or negative nos.
   d) |I – B| must be a negative number
2. For which value of K the matrix $A = \begin{pmatrix} 2 & K \\ 3 & 5 \end{pmatrix}$ has no inverse

   a) $3/10$ b) $10/3$ c) 3 d) 10
3. What type of conic section does the equation $4x^2+4xy + y^2 – 4x + 32y + 16 = 0$ represent?
   a) Parabola b) Hyperbola c) Ellipse d) Rectangular hyperbola
4. The length of the latusrectum of the parabola $3x^2 + 8y = 0$ is

   a) $\frac{8}{3}$ b) $\frac{2}{3}$ c) 8 d) $\frac{3}{8}$
5. The average fixed cost of the cost function $c(x) = 3x^3 + 4x^2 + 5$

   a) $3/x$ b) $4/x$ c) $5/x$ d) $-5/x$
6. The point where the tangent drawn to the curve $y^2 = x$ makes an angle 45^o with the x axis

   a) $\left(\frac{1}{2}, \frac{1}{4}\right)$ b) $\left(\frac{1}{2}, \frac{1}{2}\right)$ c) $\left(\frac{1}{4}, \frac{1}{2}\right)$ d) (1, –1)
7. If $U = 4x^2 – 3y^2 + 6$, then $\frac{\partial u}{\partial y}$ =

   a) 8x b) 6y c) 0 d) -8
8. The degree of the homogeneous function $f(x, y) = \frac{x^{1/2} + y^{1/2}}{x^{1/3} + y^{1/3}}$ is

   a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $\frac{1}{5}$
9. The value of $\int_{\pi/6}^{\pi/3} \frac{dx}{1+\sqrt{\tan x}}$ is

   a) $\frac{\pi}{6}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{12}$ d) $\frac{2\pi}{3}$
10. The area of the region bounded by y = x, x axis and x = 1 is

    a) 1 b) $\frac{1}{2}$ c) log 2 d) 2

11. The differential equation of the concentric circles $x^2 + y^2 = a^2$, where a is the parameter is

a) $\frac{dy}{dx} = \frac{x}{y}$ b) $\frac{dy}{dx} = \frac{-x}{y}$ c) $\frac{dy}{dx} = \frac{y}{x}$ d) $\frac{dy}{dx} = \frac{-y}{x}$

12. The solution of the equation of the type $\frac{dy}{dx} + Py = 0$ where P is a function of x is given by

a) $ye^{\int Pdx} = c$ b) $y^{\int Pdx} = c$ c) $xe^{\int Pdx} = y$ d) $y = cx$

13. The definition of the shifting operator E is

a) E(f(x)) = f(x–h) b) E (f(x)) = f(x) c) E(f(x)) = f(x+h)
d) E(f(x)) = f(x+2h)

14. Five data relating to x and y are to be fit in a straight line. It is found that Σx = 0 and Σy = 15. Then the y-intercept of the line of best fit is

a) 1 b) 2 c) 3 d) 4

15. $E(X^2) = 8.1$ and the standard deviation is 0.9 then E(x) is

a) 0.81 b) 2.7 c) 0.9 d) 8.1

16. In a binomial distribution if the mean and variance are 8 and 4 respectively, then P (X=1)=

a) $\frac{1}{2^{12}}$ b) $\frac{1}{2^4}$ c) $\frac{1}{2^5}$ d) $\frac{1}{2^{10}}$

17. In a sample of 500 apples taken from a large consignment, if 455 were found to be good, then the ratio of bad apples is

a) 0.9 b) 0.09 c) 0.009 d) 9

18. A hypothesis complementary to the null hypothesis is called

a) Primary hypothesis b) Statistical statement c) Alternative hypothesis
d) Confidence hypothesis

19. The point of intersection of regression lines is

a) (x, y) b) $(\bar{x}, \bar{y})$ c) (0, 0) d) none of these

20. Index number is a

a) measure of relative changes b) a special type of an average
c) a percentage relative d) all the above

PART - B (7 × 2 = 14)

Answer any seven of the following. Question no. 30 is compulsory.

21. If $A = \begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 0 & -1 \\ 1 & 2 \end{pmatrix}$, find the inverse of AB.

22. Find the elasticity of demand for the function y = 4x – 8. Also find its value when x = 6.

23. If $U(x, y) = 1000 - x^3 - y^2 + 4x^3y^2 + 8y$, find $\frac{\partial^2 u}{\partial x^2}$.

24. If the marginal revenue for a commodity is $MR = 9 - 6x^2 + 2x$, find the total revenue and demand function.

25. Find the order and degree of the differential equation $\frac{d^2y}{dx^2} = \left[4 + \left(\frac{dy}{dx}\right)^2\right]^{3/4}$.

26. From the following data, find the value of y using graph when x = 27.

x	10	15	20	25	30
y	35	32	29	26	23

27. If $f(x) = \begin{cases} 3x^2 ; & 0 < x < 1 \\ 0 ; & \text{otherwise} \end{cases}$ check whether f(x) is a probability density function.
28. A sample of five measurements of the diameter of a sphere were recorded by a scientist as 6.33, 6.37, 6.36, 6.32 and 6.37 mm. Determine the point estimate of mean.
29. Find the coefficient of correlation from the following data
$\Sigma x^2 = 650$, $\Sigma x = 125$, $\Sigma y^2 = 436$, $\Sigma xy = 520$, $N = 25$
30. Find the equation of the parabola having the vertex (4, 1) and the focus (4, – 3).

PART - C (7 × 3 = 21)

Answer any seven of the following.
Question No. 40 is compulsory.

31. Find the rank of the matrix:
$$\begin{pmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{pmatrix}$$
32. Find the equation of the hyperbola having the foci (6, 4) and (– 4, 4) and the eccentricity 2.
33. The curve $y = ax^2 – 6x + b$ passes through the point (0, 2) and the tangent drawn to it at x = 1.5 is parallel to the x axis. Find the values of a and b.
34. Find the absolute (global) maximum and minimum values to $f(x) = x – 2 \sin x$, in the interval $0 \leq x \leq 2p$.
35. Determine the cost of producing 3000 units of commodity, if the marginal cost in rupees per unit is $C'(x) = \frac{x}{3000} + 2.50$.
36. Fit a straight line to the data $\Sigma x = 10$, $\Sigma y = 15$, $\Sigma x^2 = 30$, $\Sigma xy = 43$ and $n = 5$.
37. A man plans to invest some amount in a small saving scheme with a guaranteed compound interest compounded continuously at the rate of 12% for 5 years. How much should he invest, if he wants an amount of Rs. 25,000 at the end of 5 year period. ($e^{-0.6} = 0.5488$)
38. Calculate the cost of living index number using family Budget method.

Commodity	A	B	C	D	E
Quantity in Base year (unit)	20	50	50	20	40
Price in Base year (Rs.)	10	30	40	200	25
Price in current year	12	35	50	300	50

39. The income distribution of the population of a village has a mean of Rs. 6,000 and a variance of Rs. 32,400. A sample of 64 persons has been taken from the population and it has an average value of Rs. 5,950. Find the test statistic value z.
40. In a Binomial distribution, if n = 5 and P (X = 3) = 2 P (X = 2). Find the value of p.

Part - D (7 × 5 = 35)

Ansswer all the questions.

41. a) Find the value of k for the equations $2x – 3y + z = 0$, $x + 2y – 3z = 0$ and $4x – y+kz= 0$ to have trivial and non trivial solutions.

(or)

b) Find the eccentricity, centre, foci and vertices of the ellipse

$9x^2 - 16y^2 - 18x - 64y - 199 = 0$

42. a) Find the equations of the tangent and normal to ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point (a Cos θ , b Sin θ).

(or)

b) From the data given below:

Find (i) Time between each order for item A.

(ii) The number of orders per year for item B

(iii) The minimum average cost for item C.

Item	Monthly Require-ments	Ordering cost per order	Carrying cost
A	9000	Rs. 200	Rs. 3.60
B	25000	Rs. 648	Rs. 10.00
C	8000	Rs. 100	Rs. 0.60

43. a) The demand and supply function for a commodity are given by $P_d = 15 - x$ and $P_S = 0.3x + 2$. Find the consumer's surplus at the market equilibrium price.

(or)

b) Solve: $(x^3 + 3xy^2)\,dx + (y^3 + 3x^2y)\,dy = 0$

44. a) Using Gregory-Newton's formula, estimate the population of a town for the year 1995.

Year (X)	1961	1971	1981	1991	2001
Population (Y) (in 1000)	46	66	81	93	101

(or)

The mean life time of 50 electric bulbs produced by a manufacturing company is estimated to be 825 hrs with a standard deviation of 110 hrs. If μ is the mean life time of all bulbs produced by the company, test the hypothesis that μ =900 hrs at 5% level of significance.

45. a) In a normal distribution 20% of the items are less than 100 and 30% are over 200. Find the mean and S.D. of the distribution.

(or)

b) Find the regression equations for the data given below.

X	40	38	35	42	30
Y	30	35	40	36	29

46. a) Find the differential equation of the curves $y = ae^{3x} + be^{x}$ where a and b are parameters.

(or)

b) Suppose the inter-relationship between the production of two industries P and Q in a year (in lakhs of rupees) is

Producer	User		Final Demand	Total output
	P	Q		
P	15	10	10	35
Q	20	30	15	65

Find the outputs if the final demand changes to

(i) 12 for P and 18 for Q (ii) 8 for P and 12 for Q.

47. a) Evaluate :

$$\int_{\pi/6}^{\pi/3} \frac{a \cos x + b \sin x}{\cos x + \sin x} dx$$

(or)

b) Calculate the seasonal indices for the following data by the method of simple average.

Quarters	Years				
	1994	1995	1996	1997	1998
I	78	76	72	74	76
II	66	74	68	70	74
III	84	82	80	84	86
IV	80	78	70	74	82