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Register Number | | | | | | |

Part III — BUSINESS MATHEMATICS

(English Version)

Time Allowed : 3 Hours] [Maximum Marks : 200

SECTION – A

N. B. : i) Answer *all* the 40 questions.

ii) Each question carries *one* mark.

iii) Choose and write the correct answer from the four choices given.

$40 \times 1 = 40$

1. The adjoint of $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$ is

a) $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ b) $\begin{pmatrix} 0 & -2 \\ -2 & 0 \end{pmatrix}$

c) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ d) $\begin{pmatrix} 0 & 2 \\ 2 & 0 \end{pmatrix}$.

2. If $|A| = 0$, then $|\text{Adj } A|$ is

a) 0 b) 1

c) – 1 d) ± 1.

[Turn over

3. The rank of a zero matrix is

a) 0 b) 1

c) -1 d) ∞.

4. If the minor of a_{23} equals the cofactor of a_{23} in $|a_y|$ then the minor of a_{23} is

a) 1 b) 2

c) 0 d) 3.

5. A system of linear homogeneous equations has at least

a) one solution b) two solutions

c) three solutions d) four solutions.

6. The eccentricity of a parabola is

a) 1 b) 0

c) 2 d) -1.

7. Equation of a directrix of $y^2 = -8x$ is

a) $x + 2 = 0$ b) $x - 2 = 0$

c) $y + 2 = 0$ d) $y - 2 = 0$.

8. The length of latus rectum of $4x^2 + 9y^2 = 36$ is

a) $\frac{4}{3}$ b) $\frac{8}{3}$

c) $\frac{4}{9}$ d) $\frac{8}{9}$.

9. Asymptotes of a hyperbola passes through

a) one of the foci b) one of the vertices

c) the centre of the hyperbola d) one end of its latus rectum.

10. The average fixed cost of the function $c = 2x^3 - 3x^2 + 4x + 8$ is

a) $\frac{2}{x}$ b) $\frac{4}{x}$

c) $\frac{-3}{x}$ d) $\frac{8}{x}$.

11. The demand for some commodity is given by $q = -3p + 15$ ($0 < p < 5$) where p is the unit price. The elasticity of demand is

a) $\frac{9p^2 + 15}{p}$ b) $\frac{9p - 45}{p}$

c) $\frac{15p - 9}{p}$ d) $\frac{p}{-p + 5}$.

12. If $y = 2x^2 + 3x$, the instantaneous rate of change of y at $x = 4$ is

a) 16 b) 19

c) 30 d) 4.

[Turn over

13. The slope of the tangent at (2, 8) on the curve $y = x^3$ is

a) 3 b) 12

c) 6 d) 8.

14. The point at which the tangent to the curve $y^2 = x$ makes an angle $\frac{\pi}{4}$ with the x-axis is

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) $(1, -1)$.

15. The stationary value of x for $f(x) = 3(x-1)(x-2)$ is

a) 3 b) $\frac{3}{2}$

c) $\frac{2}{3}$ d) $\frac{-3}{2}$.

16. If $u = e^{x^2 + y^2}$, then $\frac{\partial u}{\partial x}$ is equal to

a) $y^2 u$ b) $x^2 u$

c) $2xu$ d) $2yu$.

17. The elasticity of demand when marginal revenue is zero, is

a) 1 b) 2

c) -5 d) 0.

18. The cost function $y = 40 - 4x + x^2$ is minimum when

a) $x = 2$ b) $x = -2$

c) $x = 4$ d) $x = -4$.

19. If $f(x)$ is an odd function then $\int_{-a}^{a} f(x)dx$ is

a) 1 b) $2a$

c) 0 d) a.

20. $\int_{-\pi/2}^{\pi/2} \sin x \, dx$ is

a) 0 b) -1

c) 1 d) $\frac{\pi}{2}$.

21. If the marginal cost function $MC = 2 - 4x$, then the cost function is

a) $2x - 2x^2 + k$ b) $2 - 4x^2$

c) $\frac{2}{x} - 4$ d) $2x - 4x^2$.

22. The degree and order of the differential equation $\frac{d^2y}{dx^2} - 6\sqrt{\frac{dy}{dx}} = 0$ are

a) 2 and 1 b) 1 and 2

c) 2 and 2 d) 1 and 1.

23. The solution of $x\,dy + y\,dx = 0$ is

a) $x + y = c$ b) $x^2 + y^2 = c$

c) $xy = c$ d) $y = cx$.

24. The integrating factor of $x\frac{dy}{dx} - y = e^x$ is

a) $\log x$ b) $e^{-1/x}$

c) $\frac{1}{x}$ d) $-\frac{1}{x}$.

25. The solution of $\frac{d^2y}{dx^2} - y = 0$ is

a) $(A + B)e^x$ b) $(Ax + B)e^{-x}$

c) $Ae^x + \frac{B}{e^x}$ d) $(A + Bx)e^{-x}$.

26. $\Delta f(x) =$

a) $f(x + h)$ b) $f(x) - f(x + h)$

c) $f(x + h) - f(x)$ d) $f(x) - f(x - h)$.

27. E is equal to

a) $1 + \Delta$ b) $1 - \Delta$

c) $\nabla + 1$ d) $\nabla - 1$.

28. The mean and variance of a binomial distribution are

a) np, npq b) pq, npq

c) $np, \sqrt{npq}$ d) np, nq.

29. The Normal distribution curve is

a) bimodal b) unimodal

c) skewed d) none of these.

30. The standard deviation of Poisson variate is 2. The mean of the Poisson variate is equal to

a) 2 b) 4

c) $\sqrt{2}$ d) $\frac{1}{\sqrt{2}}$.

31. If $X \sim N(8, 64)$, the standard normal variate Z will be

a) $\frac{X-64}{8}$ b) $\frac{X-8}{64}$

c) $\frac{X-8}{8}$ d) $\frac{X-8}{\sqrt{8}}$.

32. The standard error of the sample mean is

a) Type I error

b) Type II error

c) Standard deviation of the sampling distribution of the mean

d) Variance of the sampling distribution of the mean.

[Turn over

33. If a random sample of size of 64 is taken from a population whose standard deviation is equal to 32, then the standard error of the mean is

a) 0·5 b) 2

c) 4 d) 32.

34. The Z value that is used to establish a 95% confidence interval for the estimation of a population parameter is

a) 1·28 b) 1·65

c) 1·96 d) 2·58.

35. The number of ways in which one can select 2 customers out of 10 customers is

a) 90 b) 60

c) 45 d) 50.

36. A time series consists of

a) two components b) three components

c) four components d) none of these.

37. Index numbers are expressed

a) in percentages b) in ratios

c) in terms of absolute value d) all of these.

38. The weights used in Paasche's formula belong to

a) the base period

b) the current period

c) to any arbitrary chosen period

d) none of these.

39. Cyclic variations in a time series are caused by

a) lock-out in a factory b) war in a country

c) floods in the states d) none of these.

40. The term 'regression' was introduced by

a) R. A. Fisher b) Sir Francis Galton

c) Karl Pearson d) None of them.

SECTION – B

N. B. : i) Answer any *ten* out of *fifteen* questions given.

ii) Each question carries *six* marks. $10 \times 6 = 60$

41. Find the inverse of $A = \begin{pmatrix} 1 & 0 & a \\ 0 & 1 & b \\ 0 & 0 & 1 \end{pmatrix}$.

42. Solve the equations $2x - 3y - 1 = 0$; $5x + 2y - 12 = 0$ by Cramer's rule.

[Turn over

43. Find the focus, latus rectum, vertex and directrix of the parabola $y^2 + 4x - 2y + 3 = 0$.

44. Find the elasticity of supply for the supply function $x = 2p^2 + 8p + 10$.

45. At what points on the curve $3y = x^3$ the tangents are inclined at 45° to the x-axis ?

46. Find the points of inflexion of the curve $y = x^4 - 4x^3 + 2x + 3$.

47. Find the area of the circle of radius 'a'.

48. Solve : $x\left(y^2 + 1\right)dx + y\left(x^2 + 1\right)dy = 0$.

49. Solve : $\left(3D^2 - D + 1\right)y = 0$.

50. From the following data find $f(3)$:

x :	1	2	3	4	5
$f(x)$:	2	5	—	14	32

51. If $f(0) = 5$, $f(1) = 6$, $f(3) = 50$, $f(4) = 105$, find $f(2)$ by using Lagrange's formula.

52. Find the mean, variance and the standard deviation for the following pr... distribution :

Values of X, x :	1	2	3	4
Probability $P(x)$:	0·1	0·3	0·4	0·2

53. A random sample of size 50 with mean 67·9 is drawn from a normal population. If it is known that the standard error of the sample mean is $\sqrt{0·7}$, find 95% confidence interval for the population mean.

54. Calculate the correlation co-efficient from the following data :

$N = 25 \quad \sum x = 125 \quad \sum y = 100$

$\sum x^2 = 650 \quad \sum y^2 = 436 \quad \sum xy = 520$

55. Find the trend values to the following data by the method of semi-averages :

Year	1980	1981	1982	1983	1984	1985	1986
Sales	103	105	113	110	108	116	112

[Turn over

SECTION – C

N. B. : i) Answer any *ten* questions out of *fifteen* questions given.

ii) Each question carries *ten* marks. $10 \times 10 = 100$

56. Solve the following equations by using matrix method :

$3x - y - z = -2$

$x + y + z = 6$

$x - 2y + 4z = 9$

57. In an economy of two industries P and Q, the following table gives the supply and demand position in millions of rupees :

Producer	User		Final Demand	Total Output
	P	Q		
P	16	20	4	40
Q	8	40	32	80

Find the outputs when the final demand changes to 18 for P and 44 for Q.

58. Find the centre, eccentricity, foci and directrices of the $3x^2 + 4y^2 - 6x + 8y - 5 = 0$.

59. Determine the co-efficients a and b so that the curve $y = ax^2 - 6x + b$ may pass through the point (0, 2) and have its tangent parallel to the x-axis at $x = 1{\cdot}5$.

60. For the cost function $C = 2000 + 1800x - 75x^2 + x^3$, when is the total cost (C) increasing and when is it decreasing ? Also discuss the behaviour of the marginal cost (MC).

61. The demand for a quantity A is $q_1 = 16 - 3p_1 - 2p_2^2$

Find :

i) the partial elasticities $\frac{Eq_1}{Ep_1}, \frac{Eq_1}{Ep_2}$

ii) the partial elasticities for $p_1 = 2$ and $p_2 = 1$.

62. Evaluate $\int_0^2 \frac{\sqrt{x}\,dx}{\sqrt{x} + \sqrt{2 - x}}$.

63. Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

[Turn over

64. Suppose that the quantity demanded $Q_d = 42 - 4p - 4\frac{dp}{dt} + \frac{d^2p}{dt^2}$ and the quantity supplied $Q_s = -6 + 8p$ where p is the price. Find the equilibrium price for market clearance.

65. If $y_{75} = 2459$, $y_{80} = 2018$, $y_{85} = 1180$ and $y_{90} = 402$, find y_{82}.

66. Given the p.d.f. of a continuous random variable X as follows

$$f(x) = \begin{cases} kx(1-x), & \text{for } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find k and c.d.f.

67. It is stated that 2% of razor blades supplied by a manufacturer are defective. A random sample of 200 blades is drawn from a lot. Find the probability that 3 or more blades are defective $\left(e^{-4} = 0{\cdot}01832\right)$.

68. The mean I.Q. of a sample of 1600 children was 99. Is it likely that this was a random sample from a population with mean I.Q. 100 and standard deviation 15 ? (Test at 5% level of significance).

69. Find the co-efficient of correlation for the data given below :

x :	10	12	18	24	23	27
y :	13	18	12	25	30	10

70. Calculate the Cost of Living Index Number using Family Budget method :

Commodity	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
Quantity in Base year (unit)	20	50	50	20	40	50	60	40
Price in Base year (Rs.)	10	30	40	200	25	100	20	150
Price in Current year (Rs.)	12	35	50	300	50	150	25	180