

**Standard 11**  
**BUSINESS MATHS AND STATISTICS**

Time: 3.00 Hours

Marks: 70

**I. Choose the most appropriate answer from the given four alternatives and write the option code and corresponding answer:**

- 1) If any three rows or columns of a determinant are identical then the value of the determinant is \_\_\_\_\_  
a) -1                                      b) 1                                      c) 2                                      d) 0
- 2) If  $\begin{vmatrix} x & 2 \\ 8 & 5 \end{vmatrix}$  then the value of x is \_\_\_\_\_  
a) -5/6                                      b) 5/6                                      c) -16/5                                      d) 16/5
- 3) The constant term in the expansion of  $(x + \frac{2}{x})^6$  is \_\_\_\_\_  
a) 156                                      b) 165                                      c)  $nC_2$                                       d)  $nC_2 - 2$
- 4) The number of diagonals in a polygon of n sides is equal to \_\_\_\_\_  
a)  $nC_2 - n$                                       b)  $nC_2 - 1$                                       c)  $nC_2$                                       d)  $nC_2 - 2$
- 5) (1, -2) is the centre of the circle  $x^2 + y^2 + ax + by - 4 = 0$  then its radius  
a) 4                                      b) 3                                      c) 1                                      d) 2
- 6) The angle between the pair of straight lines  $x^2 - 7xy + 4y^2 = 0$  is \_\_\_\_\_  
a)  $\tan^{-1}(\frac{1}{3})$                                       b)  $\tan^{-1}(\frac{1}{2})$                                       c)  $\tan^{-1}(\frac{\sqrt{33}}{5})$                                       d)  $\tan^{-1}(\frac{5}{\sqrt{33}})$
- 7) If  $\sin A + \cos A = 1$  then  $\sin 2A$  is equal to \_\_\_\_\_  
a)  $\frac{1}{2}$                                       b) 1                                      c) 2                                      d) 0
- 8) The radian measure of  $37^\circ 30'$  is \_\_\_\_\_  
a)  $\frac{7\pi}{24}$                                       b)  $\frac{5\pi}{24}$                                       c)  $\frac{9\pi}{24}$                                       d)  $\frac{3\pi}{24}$
- 9) Which of the following function is neither even nor odd?  
a)  $f(x) = x^{10}$                                       b)  $f(x) = x^3 + 5$                                       c)  $f(x) = x^2$                                       d)  $f(x) = x^5$
- 10) If  $y = \log x$ , then  $y_2 =$  \_\_\_\_\_  
a)  $\frac{1}{x}$                                       b)  $-\frac{1}{x^2}$                                       c)  $-\frac{2}{x^2}$                                       d)  $e^2$
- 11) The demand function is always  
a) increasing function                                      b) decreasing function  
c) non-decreasing function                                      d) undefined function
- 12) Relationship among MR, AR and  $h_d$  is \_\_\_\_\_  
a)  $h_d = \frac{AR}{AR - MR}$                                       b)  $h_d = AR - MR$                                       c)  $MR = AR = h_d$                                       d)  $AR = \frac{MR}{h_d}$
- 13) Purchasing price of one share of face value Rs. 100 available at a discount of  $9\frac{1}{2}\%$  with brokerage  $\frac{1}{2}\%$  is  
a) Rs. 89                                      b) Rs. 90                                      c) Rs. 91                                      d) Rs. 95
- 14) The % of income on 7% stock at Rs. 80 is \_\_\_\_\_  
a) 9%                                      b) 8.75%                                      c) 8%                                      d) 7%
- 15) Probability of an impossible event is \_\_\_\_\_  
a) 1                                      b) 0                                      c) 0.2                                      d) 0.5
- 16) If median 45 and its coefficient is 0.25, then the mean deviation about median is \_\_\_\_\_  
a) 11.25                                      b) 180                                      c) 0.0056                                      d) 45

- 17) If the values of two variables move in same direction then the correlation is said to be  
 a) negative      b) positive      c) perfect positive      d) no correlation
- 18) If regression co-efficient of y on x is 2, then the regression coefficient of x on y is \_\_\_\_\_  
 a)  $\frac{1}{2}$       b) 2      c)  $> \frac{1}{2}$       d) 1
- 19) A solution which maximizes or minimizes the given LPP is called \_\_\_\_\_  
 a) a solution      b) a feasible solution  
 c) an optimal solution      d) none of these
- 20) One of the conditions for the activity (i, j) to lie on the critical path is \_\_\_\_\_  
 a)  $E_j - E_i = L_j - L_i = t_{ij}$   
 b)  $E_i - E_j = L_j - L_i = t_{ij}$   
 c)  $E_i - E_j = L_i - L_j = t_{ij}$   
 d)  $E_j - E_i = L_j - L_i \neq t_{ij}$

**II. Answer any seven questions. Q.No. 30 is compulsory:**

**7×2=14**

- 21) If  $A = \begin{bmatrix} 2 & 4 \\ -3 & 2 \end{bmatrix}$  then find  $A^{-1}$ .
- 22) Find the number of arrangements that can be made out of the letters of the word "MATHEMATICS"
- 23) Find the centre and radius of the circle  $x^2 + y^2 - 8x + 6y - 24 = 0$
- 24) Find the value of  $\tan 105^\circ$
- 25) If  $f(x) = x^n$  and  $f'(1) = 5$ , then find the value of n.
- 26) Find the market value of 62 shares available at 2132 having the par value of Rs.100
- 27) Find the elasticity of supply for the supply function  $x = 2p^2 + 5$  when  $p = 3$ .
- 28) Calculate the Harmonic mean for the following values:  
 1, 45, 10, 4, 11.2, 0.5, 175.0, 0.01
- 29) Calculate the co-efficient of correlation from the following data:  
 $\Sigma_x = 50$ ,  $\Sigma_y = -30$ ,  $\Sigma x^2 = 290$ ,  $\Sigma y^2 = 300$ ,  $\Sigma xy = -115$  and  $N = 10$ .
- 30) Draw the network diagram for the following activities:

Activity code	A	B	C	D	E	F	G	H
Predecessor	-	-	A	B	C,D	C,D	E	F
Activity								

**III. Answer any seven questions. Q.No. 40 is compulsory:**

**7×3=21**

- 31) Show that the matrices  $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} \frac{4}{5} & -\frac{2}{5} & -\frac{1}{5} \\ -\frac{1}{5} & \frac{3}{5} & -\frac{1}{5} \\ -\frac{1}{5} & -\frac{2}{5} & \frac{4}{5} \end{bmatrix}$  are inverses

of each other.

- 32) Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?
- 33) Find the locus of the point which is equidistant from (2, -3) and (3, -4)
- 34) Prove that  $\tan^{-1}\left(\frac{4}{3}\right) - \tan^{-1}\left(\frac{1}{7}\right) = \frac{\pi}{4}$

- 35) Evaluate:  $\lim_{x \rightarrow \infty} \frac{6 - 5x^2}{4x + 15x^2}$



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3

- 36) Find the present value of Rs. 2000 p.a. for 14 years at the rate of interest of 10% per annum.  $[(1.1)^{-14} = 0.2632]$
- 37) A can solve 90% of the problems given in a book and B can solve 70%. What is the probability that atleast one of them will solve a problem selected at random?
- 38) The rank of 10 students of same batch in two subjects A and B are given below. Calculate the rank correlation coefficient

Rank of A	1	2	3	4	5	6	7	8	9	10
Rank of B	6	7	5	10	3	9	4	1	8	2

- 39) Solve the following LPP:

$$\text{Maximum } Z = 2x_1 + 3x_2$$

$$\text{Subject to the constraints } x_1 + x_2 \geq 30 ; x_2 \leq 12 ; x_1 \leq 20 ; x_1, x_2 \geq 0$$

- 40) If  $u = x^2 y^3 \cos\left(\frac{y}{x}\right)$  prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 5u$  by using Euler's Theorem.

Answer the following:

7x5=35

- 41) a) In an economy there are two industries  $P_1$  and  $P_2$  and the following table gives the supply and the demand position in crores of rupees.

Production section	Consumption sector		Final Demand	Gross Output
	P1	P2		
P1	10	25	15	50
P2	20	30	10	60

Determine the outputs when the final demand changes to 35 for  $P_1$  and 42 for  $P_2$ .

(OR)

b) Show that  $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

- 42) a) By the principle of mathematical induction prove that  $n^2 + n$  is an even number, for all  $n \in \mathbb{N}$ .

(OR)

b) If  $y = a \cos mx + b \sin mx$  then show that  $y_2 + m^2 y = 0$

- 43) a) Show that the middle term in the expansion of  $(1+x)^{2n}$  is

$$\frac{1.3.4.....(2n-1)2^n x^n}{n!}$$

(OR)

- b) Find out the coefficient of mean deviation about median in the following series

Age in years	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of persons	8	12	16	20	37	25	19	13

- 44) a) Find the vertex, focus, axis, directrix and the length of latus rectum of the parabola  $y^2 - 8y - 8x + 24 = 0$

(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  $P_2 = 7$

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- 45) a) A photographer purchases a camera on instalments. He has to pay 7 annual instalments each of Rs. 36000 right from the date of purchase. If the rate of compound interest is 16% then find the cost price (present value) of the camera.  $[(1.16)^7 = 2.828]$

(OR)

- b) Calculate Karl Pearson's coefficient of correlation from the following data:

X	6	8	12	15	18	20	24	28	31
Y	10	12	15	15	18	25	22	26	28

- 46) a) The total revenue function for a commodity is  $R = 15x + \frac{x^2}{3} - \frac{1}{36}x^4$  show that at the highest point, average revenue is equal to the marginal revenue.

(OR)

- b) Bag I contains 3 red and 4 black balls, while Bag II contains 5 red balls and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from Bag I.

- 47) a) Find the equation of the circle passing through the points (0, 1) (1, -1) (4, 3)

(OR)

- b) Construct the network for the project whose activities are given below:

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration (in week)	3	8	12	6	3	3	8	5	3	8

Calculate the Earliest Start time (EST) Earliest Finist Time (EFT) Latest Start Time (LST) and Latest Finish Time (LFT) of each activity. Determine the critical path and the project completion time.

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