VK11BM COMMON HALF YEARLY EXAMINATION - DECEMBER 2018

Standard 11 Reg.No. | | | | | | |

BUSINESS MATHEMATICS AND STATISTICS

Time Allowed: 2.30 Hrs. Maximum Marks: 90

Instructions: 1. **Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.**
2. **Use Blue or Black ink to write and underline.**

PART - A

Answer all questions write the option code and the corresponding answer: **20×1=20**

1) If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then $|2A|$ is equal to
   a) $4\cos 2\theta$ b) 4 c) 2 d) 1

2) The value of x if $\begin{vmatrix} 0 & 1 & 0 \\ x & 2 & x \\ 1 & 3 & x \end{vmatrix} = 0$ is
   a) -1 b) 0, 1 c) -1, 1 d) -1, -1

3) If A is 3 × 3 matrix and $|A| = 4$ then $|A^{-1}|$ is equal to
   a) ¼ b) $^1/_{16}$ c) 2 d) 4

4) Sum of the binomial co-efficient is
   a) 2n b) n^2 c) 2n d) n + 17

5) If $nP_r = 720(nC_r)$ then r is equal to
   a) 4 b) 5 c) 6 d) 7

6) The eccentricity of the parabola is
   a) 3 b) 2 c) 0 d) 1

7) The slope of the line 7x + 5y - 8 = 0 is
   a) $\frac{7}{5}$ b) $-\frac{7}{5}$ c) $\frac{5}{7}$ d) $-\frac{5}{7}$

8) If P sec 50° = tan50° then P is
   a) cos50° b) sin50° c) tan50° d) sec50°

9) If $f(x) = x^2$ differentiable at
   a) x = 1 b) x = -1 c) x = 2 d) x = -2

10) If y = logx then y_2 =
   a) $\frac{1}{x}$ b) $-\frac{1}{x^2}$ c) $-\frac{2}{x^2}$ d) e^2

11) Average cost [AC] is minimum, when
   a) AR = MR b) MR = MC c) MC = AC d) AC = AR

12) If $u = x^3 + 3xy^2 + y^3$ then $\frac{\partial^2 u}{\partial y \partial x}$ is
   a) 3 b) 6y c) 6x d) 2

13) The Income on 7% stock at 80 is
   a) 9% b) 8.75% c) 8% d) 7%

14) The median of 10, 14,11,9, 8, 12, 6 is
   a) 10 b) 12 c) 14 d) 9

15) The two events A and B are mutually exclusive if
a) $P(A \cap B) = 0$ b) $P(A \cap B) = 1$ c) $P(A \cup B) = 0$ d) $P(A \cup B) = 1$

16) The correct relationship among A.M., G.M., and H.M., is
a) A.M. < G.M. < H.M b) G.M. ≥ A.M ≥ H.M
c) H.M. ≥ G.M. ≥ A.M. d) A.M. ≥ G.M. ≥ H.M.

17) If $P(A) = \frac{3}{5}$ and $P(B) = \frac{1}{5}$ then $P(A \cap B)$
a) $\frac{1}{25}$ b) $\frac{2}{25}$ c) $\frac{3}{25}$ d) $\frac{4}{25}$

18) If $f'(c) = 0$ and $f''(c) < 0$, then f has
a) a local maximum at c b) a maximum at c
c) a local minimum at c d) a minimum at c

19) If $nC_x = nC_y$ then either
a) $x = y$ or $x + y = n$ b) $x \neq y$ or $x + y = n$
c) $x = y$ or $x - y = n$ d) $x \neq y$ or $x - y = n$

20) $\tan\alpha = \frac{1}{3}$ and $\tan\beta = \frac{1}{7}$ then $\tan 2\alpha$ is
a) $\frac{1}{4}$ b) $\frac{2}{4}$ c) $\frac{3}{4}$ d) 1

PART - B

Answer any seven questions. Q.No. 30 is compulsory and choose any six questions from the remaining: 7×2=14

21) Show that $\begin{vmatrix} x & y & z \\ 2x+2a & 2y+2b & 2z+2c \\ a & b & c \end{vmatrix} = 0$

22) The technology matrix of an economic system of two industries is $\begin{bmatrix} 0.50 & 0.25 \\ 0.40 & 0.67 \end{bmatrix}$. Test whether the system is viable as per Hawkins - Simon conditions.

23) If $15C_{3r} = 15C_{r+3}$ find r.

24) Find the acute angle between the lines $2x - y + 3 = 0$ and $x + y + 2 = 0$.

25) The supply of a commodity is related to the price by the relation $x = \sqrt{5P - 15}$. Show that the supply curve is a parabola.

26) Show that $\sin 20^\circ \sin 40^\circ \sin 80^\circ = \frac{\sqrt{3}}{8}$

27) If $f(x) = \frac{x^7 - 128}{x^5 - 32}$, then find $\lim_{x \to 2} f(x)$

28) For the demand function $= 25\frac{1}{p^4} 1 \leq P \leq 5$, determine the elasticity of demand.

29) What is the amount of perpetual annuity of Rs.50 at 5% compound interest per year?

30) State Baye's theorem.

PART - C

Answer any seven questions Q.No. 40 is compulsory and choose any six questions from the remaining: 7×3=21

31) Three horses A, B, C are in race. A is twice as likely to win as B and B is twice as likely to win as C. What are their respective probabilities of winning?

32) If $y = \frac{2x+1}{3x+2}$ then obtain the value of elasticity at $x = 1$.

33) Differentiate $\frac{x^2}{1+x^2}$ with respect to x^2.

34) If $y = A \sin x + B \cos x$ then prove that $y_2 + y = 0$.

35) If $\tan(x + y) = 42$ and $x = \tan^{-1}(2)$, then find y.

36) The slope of one of the straight lines $ax^2 + 2hxy + by^2 = 0$ is twice that of the other, show that $8h^2 = 9ab$.

37) A Committee of 5 is to be formed out of 6 gents and 4 ladies. In how many ways this can be done when (i) atleast two ladies are included (ii) atmost two ladies are included.

38) If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ show that $A^2 - 4A + 5I_2 = 0$

39) Using Binomial theorem Expand $\left(x^2 + \frac{1}{x^2}\right)^4$

40) If $A = \begin{pmatrix} 2 & -2 & 2 \\ 2 & 3 & 0 \\ 9 & 1 & 5 \end{pmatrix}$ then show that (adj A) A = 0.

PART - D

Answer all questions: 7×5=35

41) a) You are given the following transaction matrix for a two sector economy.

Sector	Sales		Final Demand	Gross Output
	1	2		
1	4	3	13	20
2	5	4	3	12

i) Write the technology matrix.
ii) Determine the output when the final demand for the output sector 1 alone increases to 23 units. **(OR)**

b) If $\text{cosec}A + \sec A = \text{cosec}\, B + \sec B$ prove that $\text{Cot}\left(\frac{A+B}{2}\right) = \tan A \tan B$.

42) a) Find the equation of the circle passing through the points (0,1) (4, 3) and (1, -1) **(OR)**
b) Find the absolute maximum and absolute minimum of the function $f(x) = 3x^5 - 25x^3 + 60x + 1$ in the interval [-2, 1]

43) a) Verify Euler's theorem for the function $u = \frac{1}{(x^2 + y^2)^{1/2}}$.

b) A man buys 400 of Rs. 10 shares at a premium of Rs.2.50 on each share. If the rate of dividend is 12% find (i) his investment (ii) annual dividend received by him (iii) rate of interest received by him on his money.

44) a) Calculate AM, GM and HM from the following data and also find its relationship.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No.of students	5	10	25	30	20	10

(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

45) a) X speaks truth 4 out of 5 times. A die is thrown. He reports that there is a six. What is the chance that actually there was a six?

(OR)

b) Show that $MR = P\left[1 - \frac{1}{\eta_d}\right]$ for the demand function $P = 400 - 2x - 3x^2$ where p is unit price and x is quantity demand.

46) a) Show that the function $f(x) = |x|$ is not differentiable at $x = 0$.

(OR)

b) Differentiate the following with respect to $\frac{x^2+x+1}{x^2-x+1}$.

47) a) Find the axis, vertex, focus, equation of directrix and length of latus rectum for the parabola $x^2 + 6x - 4y + 21 - 0$.

(OR)

b) Find the middle terms in the expansion of $\left(x + \frac{1}{x}\right)^{11}$.

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