

Reg. No

Name

BA/BSC/BCOM DEGREE END SEMESTER EXAMINATION - NOVEMBER 2024
UGP (HONS.) SEMESTER - 1: DISCIPLINE SPECIFIC COURSE (ECONOMETRICS)
COURSE: 24UEMSDSC102: ESSENTIAL MATHEMATICS FOR ECONOMICS

(For Regular 2024 Admission)

Time: 2 Hours

Max. Mark: 70

PART - A
Answer any 5

1. Solve the following equation for x :

$$\sqrt{\left(\frac{3}{5}\right)^{1-2x}} = 4\frac{17}{27}$$

2. Find the value of the following:

i. $\log_3 \frac{1}{3}$

ii. $\log_{\sqrt{2}} 8$

3. The fourth term of A.P. is equal to 3 times its first term and seventh term exceeds twice the third term by 1. Find the first term and the common difference of the A.P.

4. Find the sum of the series $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$ upto 8 terms.

5. If $A = \{x: x \text{ is a natural number and } 1 < x \leq 6\}$ and $B = \{x: x \text{ is a natural number and } 6 < x < 10\}$. Find

i. $A \cup B$

ii. $A \cap B$

iii. $A - B$

iv. $B - A$

6. Taking the set of natural numbers as the universal set, write the compliments of the following sets:

i. $A = \{x : 2x + 5 = 9\}$

ii. $B = \{x : 2x + 1 > 10\}$

7. Which of the following relations are functions? Give reasons.

i. $R = \{(2,1), (3,1), (4,2)\}$

ii. $R = \{(2, 3), (\frac{1}{2}, 0), (2, 7), (-4, 6)\}$

- iii. $R = \{(1, 2), (2, 3), (3, 4), (4, 5), (5, 6), (6, 7)\}$
8. Let $f = \{(1, 1), (2, 3), (0, 1), (-1, -3), \dots\}$ be a function from \mathbb{Z} to \mathbb{Z} defined by $f(x) = ax + b$, for some integers a and b . Determine a and b .

(2 x 5 = 10)

PART B
Answer any 6

9. Prove that
- i. $P(n, r) = n \cdot P(n - 1, r - 1)$
 - ii. ${}^n P_r = {}^{n-1} P_r + r \cdot {}^{n-1} P_{r-1}$
10. In how many ways can final eleven be selected from 15 cricket players if
- i. there is no restriction
 - ii. one of them must be included
 - iii. one of them, who is in bad form, must always be excluded.
11. If S_1, S_2 and S_3 denote the sums of first $n, 2n$ and $3n$ terms of an A.P. Show that $S_3 = 3(S_2 - S_1)$.
12. If the third, sixth and the last terms of a G.P. are 6, 48 and 3072 respectively, find the first term and the number of terms in the G.P.
13. If A and B are two sets and U is the universal set such that $n(U) = 700, n(A) = 290, n(B) = 240$ and $n(A \cap B) = 110$, then find $n(A' \cap B')$.
14. If $A =$ The set of letters in the word 'JAIPUR' and
 $B =$ The set of letters in the word 'JODHPUR'
find the following
- i. $A \cup B$
 - ii. $A \cap B$

Also verify the following result

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

15. In a group of people, 50 people read newspaper A, 20 read newspaper B and 10 read both newspapers. How many people read at least one of the two newspapers?
16. Find the domain of the following functions:
- i. $f(x) = \frac{x^2+2x+1}{x^2-8x+12}$
 - ii. $f(x) = \frac{x+7}{x^2-8x+4}$

17. Let f, g be two functions defined by $f(x) = \sqrt{x+1}$ and $g(x) = \sqrt{9-x^2}$, describe the following functions.

- i. $f + g$
- ii. $g - f$
- iii. gf
- iv. $\frac{f}{g}$
- v. $f^2 + 7f$

(5 x 6 = 30)

PART C

Answer any 2

18. i. If $3 \log \sqrt{m} + 2 \log \sqrt[3]{n} - 1 = 0$, find the value of $m^9 n^4$.

iii. Express $\log_{10} \frac{a^2 c}{\sqrt{b}}$ in terms of $\log_{10} a, \log_{10} b, \log_{10} c$.

iv. Evaluate : $3 + \log_{10} 10^{-2}$

19. If a, b, c, d are in G.P., prove that

i. $a^n + b^n, b^n + c^n, c^n + d^n$ are in G.P.

ii. $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$

20. In an University, out of 100 students 15 offered Mathematics only; 12 offered Statistics only; 8 offered only Physics; 40 offered Physics and Mathematics; 20 offered Physics and Statistics; 10 offered Mathematics and Statistics; 65 offered Physics. By drawing a Venn diagram, find the number of students who

i. offered Mathematics,

ii. offered Statistics,

iii. did not offer any of the above three subjects.

21. Find the domain and the range of the following functions:

i. $f(x) = \sqrt{x-1}$

ii. $f(x) = \frac{1}{\sqrt{5-x}}$

iii. $f(x) = \frac{x-3}{2x+1}$

(15 x 2 = 30)