



CSS Past Papers

Subject: Pure Mathematics

Year: 2025

CSS/PMS GRAMMAR

— علم بڑی طاقت ہے —



FEDERAL PUBLIC SERVICE COMMISSION
COMPETITIVE EXAMINATION – 2025
FOR RECRUITMENT TO POSTS IN BS-17
UNDER THE FEDERAL GOVERNMENT



Roll Number

PURE MATHEMATICS

TIME ALLOWED: THREE HOURS

PART-I(MCQS): MAXIMUM 30 MINUTES

PART-I (MCQS)

**= 20 PART-II
= 80**

MAXIMUM MARKS

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NOTE:

- (i) Attempt **FIVE** questions in all by selecting from **TWO** questions each from **SELECTION A&B** and **ONE** question from **SELECTION-C**. **ALL** questions carry **EQUAL** marks.
- (iii) All the parts (if any) of each Question must be attempted at one place instead of at different places.
- (iv) Write Q. No. in the Answer Book in accordance with Q. No. in the Q.Paper.
- (v) No Page/Space be left blank between the answers. All the blank pages of Answer Book must be crossed.
- (vi) Extra attempt of any question or any part of the question will not be considered.
- (vii) **Use of calculator is allowed.**

SECTION-A

- Q. No.1.(a)** Let Q^+ be the set of positive rational numbers and define by $a * b = ab/2$ then prove that $(Q^+, *)$ is a group. **(10)**
- (b)** Find all the cyclic subgroups of Z_{18} . **(10)**
- Q. No.2. (a)** A homomorphism $\phi: Z_6 \rightarrow Z_6$ is a one to one mapping then calculate $\text{Ker}(\phi)$. **(10)**
- (b)** Check whether the vectors $a = (1,2,3)$, $b = (2,5,7)$ and $c = (1,3,5)$ are linearly dependent or independent. **(10)**
- Q. No.3. (a)** Let V be a vector space of all 2×2 matrices. W be a subspace of V which consists of all symmetric matrices then find two different basis of W . **(10)**
- (b)** Consider the transformation $T: R^{3 \times 3} \rightarrow R^{2 \times 2}$ given by $T(x, y, z) = (x, y+z)$. Check whether T is linear or not. **(10)**

SECTION-B

- Q. No.4. (a)** Find all the real numbers $x \in R$ such that $x^2 + x > 2$. **(10)**
- (b)** Use the definition of limit to establish that $\lim_{x \rightarrow 2} \frac{x^3 - 4}{x^2 + 1} = 5$ **(10)**
- Q. No.5. (a)** Use Mean Value Theorem to show that $e^x \geq 1 + x \quad \forall x \in R$. **(10)**
- (b)** Find the absolute extrema of the function $f(x,y) = xy - 2x$ on the region R given by vertices $(0, 4)$, $(4, 0)$ and $(0, 0)$. **(10)**

- Q. No.6. (a)** Change the order of integration in double integral $\int_0^2 \int_0^x f(x,y) dy dx$. (10)
(b) Draw the graph of the conic $r = 2\cos\theta$. (10)

SECTION-C

- Q. No.7. (a)** Check that the Cauchy-Riemann Equations are satisfied in polar coordinates for $f(z) = 1/z$. (10)
(b) Evaluate the contour integral $\oint f(Z) dZ$ where $f(Z) = y - x - 3ix^2$ and C is simple closed contour OABO with $O = 0+0i$, $A = 0+i$ and $B = 1+i$. (10)
- Q. No.8. (a)** Use Cauchy Residue Theorem to evaluate the integral $\oint (z^2-1)/[z(z-3)] dz$ where C is the circle $|Z| = 2$. (10)
(b) Find the Maclaurin series for the function $f(Z) = Z^2 e^{3Z}$. (10)

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