FEDERAL PUBLIC SERVICE COMMISSA



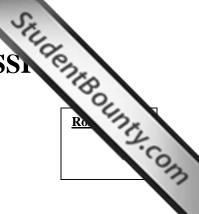
NOTE: (i)

(ii)

(iii)

TIME ALLOWED: THREE HOURS

COMPETITIVE EXAMINATION FOR RECRUITMENT TO POSTS IN BS-17 UNDER THE FEDERAL GOVERNMENT, 2011



MAXIMUM MARKS: 100

PURE MATHEMATICS, PAPER-II

questions from **SECTION – B.** All questions carry equal marks.

Use of Scientific Calculator is allowed.

Attempt FIVE questions in all by selecting THREE questions from SECTION - A and TWO

Extra attempt of any question or any part of the attempted question will not be considered.

		SECTION - A	
Q.1.	(a)	Prove that every non-empty set of real numbers that has an upper bound also has an supremum in R.	(10)
	(b)	If $x \in \mathbb{R}$, set of real numbers, then there exists $\mathbf{n} \in \mathbb{N}$ such that $\mathbf{x} < \mathbf{n}$.	(10)
Q.2.	(a)	Define continuity of a function at a point and also prove that if \mathbf{f} and \mathbf{g} be functions on \mathbf{A} to \mathbf{R} , where $\mathbf{A} \subseteq \mathbf{R}$ then $\mathbf{f} + \mathbf{g}$ and \mathbf{f} g are continuous at \mathbf{C} .	(10)
	(b)	If $f: I \to R$ is differentiable at $C \in I$, then f is continuous at C .	(10)
Q.3.	(a)	Evaluate $\int_{1}^{5} \frac{dx}{\sqrt[3]{x-2}}.$	(08)
	(b)	(i) Define Complete metric space.	(04)
		(ii) Prove that a sequence of real numbers is convergent iff it is a Cauchy sequence. This theorem is not in metric space, for justification give one example.	(08)
Q.4.	(a)	Let (\mathbf{x}, \mathbf{d}) be a matric space and \mathbf{A} a subset of \mathbf{X} . Then prove that	
		(i) Interior A° of A is an open subset of X .	(05)
		(ii) A° is the largest subset of X contained in A .	(05)
	(b)	State and prove Mean value theorem.	(10)
Q.5.	(a)	If $\sum a_n$ converges absolutely then $\sum a_n$ converges.	(10)
	(b)	Find the area enclosed by the parabola $y^2 + 16x - 71 = 0$ and the line $4x + y + 7 = 0$	(10)
		SECTION – B	
Q.6.	(a)	Let $Z = (\cos \theta + i \sin \theta)$. Then prove that $Z^n = \cos n\theta \ i \sin n\theta$ for all \mathbf{n} .	(10)
	(b)	Using De Moivre's Theorem evaluate $\left(\frac{\sqrt{3}-i}{\sqrt{3}+i}\right)^6$.	(10)
Q.7.	(a)	Expand $f(x) = x^2$, $0 < x < 2\pi$ in a Fourier series if period is 2π .	(10)
	(b)	If f(z) is analytic inside a circle C with centre at a, then for all Z inside C	(10)
		$f(z) = f(a) + f'(a)(z-a) + \frac{f''(a)}{2!}(z-a)^2 + \dots$	
Q.8.	(a)	Evaluate the integral by using Cauchy integral Formula	(10)
		$\int_{c} \frac{(4-3z)dz}{z(z-1)(z-2)} \text{where C is a circle } z = \frac{3}{2}.$	
	(b)	Prove that $\int_{0}^{2\pi} \frac{d\theta}{1 - 2pCos\theta - p^{2}} = \frac{2\pi}{1 - p^{2}}.$ ********	(10)