24MCU415

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2026
(Fourth Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

SEQUENCE, SERIES AND TRIGONOMETRY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Question No.	Question	K Level	CO
1	If $\{S_n\}_{n=1}^{\infty}$ is a sequence of real numbers, if $S_n \leq M (n \in I)$ and if $\lim_{n\to\infty} S_n = L$ then a) $L \leq M$ b) $L \geq M$ c) $L = M$ d) L/M	K1	CO1
2	A non increasing sequence which is bounded below is ___ a) Divergent b) Convergent c) Monotonic d) Oscillates	K2	CO1
3	If $\{S_n\}_{n=1}^{\infty}$ is a sequence of real numbers which converges to L then $\{S_n\}_{n=1}^{\infty}$ converges to ____ a)L^3 b) L^4 c) L^2 d) L^1	K1	CO2
4	If $\{S_n\}_{n=1}^{\infty}$ is a Cauchy sequence of real numbers then $\{S_n\}_{n=1}^{\infty}$ is_____. a) bounded above b) not bounded c) bounded below d) bounded	K2	CO2
5	If $\sum_{n=1}^{\infty} a_n$ is convergent series then $\lim_{n\to\infty} a_n$=_____ a)1 b) ∞ c)3 d) 0	K1	CO3
6	For any $x > 0$, the series $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots$ and $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots$are_____. a) divergent absolutely b) convergent c) converges absolutely d) divergent	K2	CO3
7	What is the value of $\tan\frac{\pi}{11}.\tan\frac{2\pi}{11}.\tan\frac{3\pi}{11}\tan\frac{4\pi}{11}.\tan\frac{5\pi}{11}$ =? a)$\sqrt{12}$ b) $\sqrt{11}$ c) $\sqrt{13}$ d) $\sqrt{10}$	K1	CO4
8	The value of $\sin\left(\frac{\pi}{3}+x\right) = 0.87$ then x = ____ a) 0.008 b) 0.8 c) 0.0008 d) 0.08	K2	CO4
9	If $\log(x+iy) = \alpha + i\beta$, then $r = \sqrt{x^2+y^2}$ and θ=_____ a) $\sin^{-1}\left(\frac{y}{x}\right)$ b) $\tan^{-1}(\frac{x}{y})$ c) $\tan^{-1}\left(\frac{y}{x}\right)$ d) $\tanh^{-1}(\frac{y}{x})$	K1	CO5
10	The sum of the series of $\operatorname{cosec}\theta + \operatorname{cosec}2\theta + \operatorname{cosec}2^2\theta + \cdots + \operatorname{cosec}2^{n-1}\theta$ is_____ a) $\cot\frac{\theta}{2}$ b) 0 c)1 d) $\cot\frac{\theta}{2} - \cot 2^{n-1}\theta$	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Question No.	Question	K Level	CO
11.a.	Show that if $\{S_n\}_{n=1}^{\infty}$ is a sequence of non negative numbers and if $\lim_{n\to\infty} S_n = L$ then $L \geq 0$.	K2	CO1
	(OR)		
11.b.	If the sequence of real numbers $\{S_n\}_{n=1}^{\infty}$ is convergent then prove that $\{S_n\}_{n=1}^{\infty}$ is bounded.		
12.a.	Analyze that If $\{s_n\}_{n=1}^{\infty}$ and $\{t_n\}_{n=1}^{\infty}$ are sequence of real numbers ,if $\{S_n\}_{n=1}^{\infty}$diveges to infinity and if $\{t_n\}_{n=1}^{\infty}$ is bounded then $\{s_n + t_n\}_{n=1}^{\infty}$ diverges to infinity.	K4	CO2
	(OR)		
12.b.	Analyze that if $\{s_n\}_{n=1}^{\infty}$is a convergent sequence of real numbers then $\lim_{n\to\infty} Sup\ s_n = \lim_{n\to\infty} s_n$.		
13.a.	Prove that if $\sum_{n=1}^{\infty} a_n$ is a convergent series, then $\lim_{n\to\infty} a_n$=0 .	K5	CO3
	(OR)		
13.b.	State and prove minkowski inequality.		
14.a.	Express $cos8\theta$ in terms of $\sin\theta$.	K5	CO4
	(OR)		
14.b.	If $tan(x + iy) = u + iv$, Prove that $\frac{u}{v} = \frac{sin2x}{sinh2y}$.		
15.a.	Estimate Sum the series of $sin^3\frac{\theta}{3} + 3sin^3\frac{\theta}{3^2} + 3^2 sin^3\frac{\theta}{3^3} + \cdots to\ n\ terms.$	K4	CO5
	(OR)		
15.b.	Determine the sum of the series of $cos^2 x + cos^2(x + y) + cos^2(x + 2y) + \cdots$upto n terms		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Question No.	Question	K Level	CO
16	Prove that a non decreasing sequence which is bounded above is convergent.	K5	CO1
17	If $\{s_n\}_{n=1}^{\infty}$is a convergent sequence of real numbers then *prove that* $\{s_n\}_{n=1}^{\infty}$ convergent.	K5	CO2
18	If $\sum_{n=1}^{\infty} a_n$converges absolutely then prove that $\sum_{n=1}^{\infty} a_n$ converges.	K5	CO3
19	Expand $sin^7\theta$ in a series of sines of multiples of θ.	K4	CO4
20	Reduce $(\alpha + i\beta)^{x+iy}$ to the form of $A + iB$.	K4	CO5

Z-Z-Z END