

Cluster University Srinagar
Model Question Paper (UG General Course)
Semester - I (CBCS)

Subject: Mathematics
 Course Code: MA-17101

Max Mark: 56
 Min Pass Marks: 23
 Time allowed: $2\frac{1}{2}$ hrs.

Note: Attempt any four questions from Section A, any four questions from Section B. Section C is compulsory.

Section A: Long Answer Type Questions

Marks: 4 x 8 = 32

1. State and prove Euler's Theorem on homogenous functions. Hence show that;
 $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$, where $u = \sin^{-1} \left(\frac{x^2 + y^2}{x+y} \right)$.
2. i) Show that the curves $r = a(1 + \cos \theta)$ and $r = a(1 - \cos \theta)$ intersect orthogonally.
 ii) Find pedal equation of the curve $r = a(1 - \cos \theta)$.
3. State and prove Lagrange's Mean Value Theorem. Verify it for the function;
 $f(x) = \log x$, $x \in \left[\frac{1}{2}, 2 \right]$.
4. i) If n is any integer (+ve, -ve or zero). Show that; $(\cos \theta + i \sin \theta)^n = \cos n\theta + i \sin n\theta$.
 ii) Prove that the n n^{th} roots of unity form a series in G.P.
5. State and prove Leibnitz's Theorem.
6. If $\cosh u = \sec \theta$, then show that; $u = \log \tan \left(\frac{\pi}{4} + \frac{\theta}{2} \right)$.

Section B: Problem Solving

Marks: 4 x 4 = 16

7. If $x = a \cos \theta$, $y = b \sin \theta$. Find $\frac{d^2 y}{dx^2}$.
8. If $u = e^{xyz}$. Find $\frac{\partial^3 u}{\partial x \partial y \partial z}$.
9. Find the radius of curvature for the Cardioid $r = a(1 + \cos \theta)$.
10. Find all the asymptotes for the curve $x^3 + y^3 = 3ax^2$.
11. Evaluate; $\lim_{x \rightarrow 0} (\operatorname{cosec} x - \cot x)$.
12. Separate $\tan(\alpha + i\beta)$ into real and imaginary parts.

Section C: Multiple choice Questions (Choose the correct/most appropriate option)

Marks: 8 x 1 = 8

13. i) The points of discontinuity of the function $f(x) = \frac{x^a}{(x-1)(x+3)}$, $a < 0$, $x \in R$ are;
 A. 1, 3 B. 1, -3 C. 0, 1, -3 D. 1, -3, ∞
- ii) The function defined by $f(x) = \begin{cases} \frac{\sin x}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$ is;
 A. Continuous B. Differentiable C. Continuous but Not Differentiable D. None

iii) For the orthogonal intersection of two curves $r = f_1(\theta)$ and $r = f_2(\theta)$, $\tan \phi_1 \tan \phi_2$ equals;

- A. 0
- B. 1
- C. -1
- D. None

iv) No. of asymptotes to the curve $y^2 = 4bx$, are;

- A. 1
- B. 2
- C. Infinite
- D. 0

v) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$ is the Maclaurin's Expansion of;

- A. e^{-x}
- B. $\sin x$
- C. $\log(1+x)$
- D. $\log(1-x)$

vi) $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$, is equal to;

- A. 0
- B. 1
- C. ∞
- D. -1

vii) If $z = \cos \theta + i \sin \theta$, then $z^n + z^{-n}$ is equal to;

- A. $2 \sin n\theta$
- B. $2 \cos n\theta$
- C. $2i \sin n\theta$
- D. None

viii) $\cosh^2 x + \sinh^2 x$ is equal to;

- A. 1
- B. -1
- C. $\cosh 2x$
- D. $\sinh 2x$

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Cluster University of Srinagar

(Model Question Paper)

Subject: Geography

Semester: 1st (2017)

Note: Attempt any four questions from section A and four questions from section B. Section C is compulsory.

Section: A (Long Answer Type Questions)

08 Marks each

1. Explain the main concepts of Wegner's Continental Drift Theory in detail. What evidence did Wegner provide to support his theory?
2. What are the Aeolian Landforms? How are they formed? Explain with examples.
3. How is climatology different from Meteorology? Write a detailed note on the scope and significance of Climatology.
4. What is Insolation? What factors govern the amount of Insolation received by a place on the globe?
5. What are three major movements in ocean waters? How is tide different from a wave? Describe in detail the causes and types of Tides.
6. Describe in detail the variations in temperature vertically in the ocean water. How does this variation effect the life of the oceanic organisms?

Section: B (Applied) Short Answer Type Questions

04 Marks each

1. How is the 'focal' of an earthquake found?
2. If the sea floor is continuously being formed, why is it that the size of the earth remains constant? Explain.
3. In the field, how can we distinguish between a sedimentary and an igneous rock? Note down the differences in a tabular form.
4. What are the major properties of a fertile soil? Which soil is suitable for the cultivation of cotton?
5. What is the relationship between carbon dioxide increase in the atmosphere and Global warming?
6. What are the advantages of a dented oceanic coast and why?