D. S.

B.Tech(honours) in Data Science Department
University Teaching Department, CSVTU, Bhilai
Subject –EM-1
Class Test 1-February 2022

Time: 1:30 hrs. Max. Marks: 40

Attempt all equestrian from each section.

Section A: Multiple Choice Questions: (1×10)

1.Which of the following statement is/are correct.

a. Every polynomial function is differentiable function.

b. The modulus function f(x)=|x-1|, is differentiable at x=1.

c. A function f(x) = x sin(1/x), is differentiable at x=0.

d. All of above.

2.If $x = \cos\theta,\ y = \sin\theta$ **then** $\frac{\partial(x,y)}{\partial(r,\theta)} =$

a. r **b.1** **c. 0** **d.** -1

3.The value of $\int_0^{\pi} cosx\ dx =$

a. **0** **b.1** **c. 2** **d.** -1

4.If $y = sin^{-1}(x)$ **then value of** $(y_2)_{x=0}$**, where** y_2 **is second derivative of y.**

a. 0 **b.1** **c.2** **d. -1**

5. n^{th} **derivative of sin x**

a. $\sin(n\pi + x)$ **b.** $\cos(n\pi + x)$ **c.** $\sec(n\pi + x)$ **d.** $\sin(n\frac{\pi}{2} + x)$

6. If $I_n = \int_0^{\pi/4} tan^n x dx$**,** $(n-1)(I_n + I_{n-2}) =$

a. 0 **b.1** **c.2** **d. -1**

7. $\int_0^{\frac{\pi}{2}} sin^4 x\ dx =$

a. $\frac{\pi}{4}$ b. $\frac{\pi}{8}$ c. $\frac{\pi}{32}$ *d.* $\frac{3\pi}{16}$

8.The value of the series $\sum_{r=0}^{n-1} \frac{n}{n^2+r^2}$

a. $\frac{\pi}{2}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. $\frac{\pi}{6}$

9.If y= log (sin x) then value of $(y_3)_{x=\frac{\pi}{2}}$**, where** y_3 **is second derivative of y.**

a. cot(2) b. cosec(2) c. – $cosec^2(2)$ d. $cosec^2(2)$

10. In which statement is incorrect

a. Every proper integral is convergent.

b. Every improper integral is convergent .

c. Gamma function is convergent for n>0.

d.I = $\int_0^1 \frac{dx}{x}$ is improper integral of second kind

Section B:

Descriptive Type Questions: (6×5)

1. Prove that $\beta(n, m) = \frac{\Gamma(n)\Gamma(m)}{\Gamma(n,m)}$

2.If $y = \{x + \sqrt{x^2 - 1}\}^m$, show that

$$(x^2 - 1)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0.$$

3.Prove that $\int_0^{2a} x^2\sqrt{2ax - x^2}\,dx = \frac{5\pi a^4}{8}$.

4. Change the order of integration in $I = \int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx$.

And hence evaluate.

5.If $u = x^2 \tan^{-1}(\frac{y}{x}) - y^2 \tan^{-1}(\frac{x}{y})$ then prove that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.

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