Total No. of printed pages = 7

RETEST EXAMINATION–2019

Semester : 2nd (New)

Subject Code : Sc-202

MATHEMATICS-II

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instruction :

1. Questions on both PART–A and PART–B are compulsory.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) The length of the latus rectum of the parabola $y^2 = 10x$ is _____.

   (b) The direction cosines of the z-axis are _____.

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(c) The magnitude of the vector $\vec{2i}+\vec{3j}-\vec{6k}$ is _____.

(d) If $f(x) = 3\sin x - 4\sin^3 x$, then $f\left(\frac{\pi}{2}\right)$ = _____.

(e) $\lim_{x\to 3} \frac{x^2-9}{x-3}$ = _____.

(f) $\frac{d}{dx}\left(\frac{4}{7}X^7 - \frac{2}{3}X^3\right)$ = _____.

(g) $\int(ax^3 + bx^2 + cx + d)\, dx$ = _____.

(h) $\int \frac{\log x}{x}\, dx$ = _____.

(i) $\int_1^2 (x^2-1)\, dx$ = _____.

(j) Area of the region between the curves $y^2 = 4x$ and $x = 3$ is _____.

2. Write true or false : 1×10=10

(a) $16x^2 + 16y^2 - 8x + 16y + 5 = 0$ represents a circle.

(b) The dot product of two vectors is also known as vector product.

(c) The distance of the point P(x, y, z) from the origin 0 is $x^2 + y^2 + z^2$.

(d) $f(x) = 4x - x^2$ is an odd function.

(e) The function given by :

$f(x) = x^2, x < 3$

$= 6x - 9, x \geq 3$

is continuous at $x = 3$.

(f) If $f(x) = (1+x)(1+x^2)(1+x^3)(1+x^4)$, then $f'(0) = 1$.

(g) $f(x) = 3x - x^3$ has the maximum value at $x = -1$.

(h) $\int \sec x\, dx = \log|\sec x + \tan x| + C$

(i) $\int_a^b f(x)\, dx = \int_b^a f(x)\, dx$

(j) $\int_0^2 e^x\, dx = e^2$

3. Choose the correct answer : $1\times5=5$

(a) Eccentricity of the ellipse is $\frac{x^2}{25}+\frac{y^2}{9}=1$ is

(i) $\frac{4}{5}$ (ii) $\frac{5}{4}$

(iii) $\frac{3}{5}$ (iv) $\frac{4}{9}$

(b) The co-ordinates of any point on the circle $x^2 + y^2 = 4$ are

(i) $(\cos\alpha, \sin\alpha)$

(ii) $(4\cos\alpha, 4\sin\alpha)$

(iii) $(2\cos\alpha, 2\sin\alpha)$

(iv) $(-\cos\alpha, -\sin\alpha)$

(c) $\frac{d}{dx}(\sin x^2) =$

(i) $2x\cos x^2$ (ii) $2x\sin x^2$

(iii) $2x\cos x$ (iv) $2x\cos(2x)$

(d) $\lim_{x\to5}\frac{x^2-25}{x-5}$

(i) 0 (ii) ∞

(iii) 10 (iv) 5

(e) $\int\frac{dx}{1+x^2}=$ _____ $+C$

(i) $\tan^{-1}x$ (ii) $\sin^{-1}x$

(iii) $\cos^{-1}x$ (iv) $\cot^{-1}x$

PART – B

Marks – 45

4. (a) Find the equation of the circle passing through the points (0, –3), (1, –2) and (5, –8). 3

(b) Find the co-ordinates of the foci, the length of major axis and minor axis of the ellipse

$\frac{x^2}{16}+\frac{y^2}{9}=1$ 3

(c) Show that the points (2, 3, 4), (–1, –2, 1), (5, 8, 7) are collinear. 3

(d) If $\vec{a}=\vec{i}+3\vec{j}-2\vec{k}$ and $\vec{b}=-\vec{i}+3\vec{k}$, find $|\vec{a}\times\vec{b}|$ 3

5. (a) If $f(x) = \sin x$, $g(x) = \cos x$, show that $\{g(x)\}^2 - \{f(x)\}^2 = g(2x)$. 3

(b) Find the limit : (any *two*) 3×2=6

(i) $\lim_{x \to 3} \frac{x^2 + x - 12}{x - 3}$

(ii) $\lim_{x \to 1} \frac{x - 1}{\sqrt{x-1} + \sqrt{x+1}}$

(iii) $\lim_{x \to \infty} \frac{3x^4 - 2x^2 + 1}{x^4 + 2x^2 + 1}$

(c) Examine the continuity of $f(x)$ at $x = 0$,

if $f(x) = x - 1;\ x > 0$

$= \frac{1}{2};\ x = 0$

$= x + 1;\ x < 0$ 3

(d) Find $\frac{dy}{dx}$: (any *three*) 3×3=9

(i) $\sin x + \cos y = 1$

(ii) $x = \cos\theta + \theta\sin\theta$, $y = \sin\theta - \theta\cos\theta$

(iii) $y = \sin^3 x + \cos^6 x$

(iv) $y = (x^2 + 2x + 3)^5$

6. (a) Integrate: (any *three*) : 3×3=9

(i) $\int x^2\sqrt{1+x^3}\, dx$

(ii) $\int x \sin x\, dx$

(iii) $\int_0^2 (x^2 + 2x + 1)\, dx$

(iv) $\int_0^{\frac{\pi}{2}} \frac{\sec^2 x}{1+\tan^2 x} dx$

(b) Evaluate : $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}} dx$ 3

Or

Find the area bounded by the curve $y = \sin x$, the x-axis and the ordinates at $x = 0$ and $x = \pi$.