08/08/23

Printing Pages : 1 **Paper Code: BAS – 203** **(A) (SVSU) : 2022-2023/S**

Enrollment No.

B.Tech. (All Branches)
I YEAR, II SEMESTER EXAMINATION
MATHEMATICS – II

[Time : 3:00 Hours] **[Max. Marks : 70]**

Note: Attempt all the questions as per the instructions given below:

1. Attempt all parts of the following: **(12 X 1 = 12m)**

(i) The particular integral of the differential equation $(D+2)y=0$ where $D \equiv \frac{d}{dx}$ is
(a) $\mathrm{PI}=0$ (b) $\mathrm{PI}=-2$ (c) $\mathrm{PI}=2$ (d) None

(ii) If a function $f(x)$ is defined in the interval $-\frac{\pi}{2}<x<\frac{\pi}{2}$ then its period is
(a) $-\pi$ (b) π (c) 2π (d) -2π

(iii) Beta function is also known as
(a) Euler's integral of first kind (b) Euler's integral of second kind (c) Gamma function (d) Bessel's function

(iv) If $x+iy=\sqrt{2}+3i$ then x^2+y is
(a) 7 (b) 0 (c) -7 (d) 1

(v) The integral $\int_C \frac{1}{z-a}\,dz$ where C is the circle $|z-a|=r$ is
(a) $2\pi i$ (b) $-2\pi i$ (c) 0 (d) πi

(vi) The solution of the differential equation $\frac{d^2y}{dx^2}+y=0$, is
(a) $y=A\cos 2x+B\sin 2x+\frac{1}{5}e^{-x}$ (b) $y=Ae^{-x}+Be^{x}$ (c) $y=A\cos x+B\sin x$ (d) None

(vii) If $f(z)$ is an analytic function and $f'(z)$ is continuous at each point within and on a closed curve C then $\int_C f(z)\,dz$ is
(a) $2\pi i$ (b) $-2\pi i$ (c) 0 (d) πi

(viii) The complete solution of an ordinary differential equation with constant coefficients contains
(a) complementary function (b) particular integral (c)both "a" and "b" (d) none

(ix) A sequence $< u_n >$ is convergent if $\lim_{n\to\infty} u_n$ is
(a) finite only (b) finite and unique (c) ∞ (d) $-\infty$

(x) An analytic function is also known as
(a) regular function (b) holomorphic function (c) both (d) none

(xi) For the series solution of the equation $y''+P(x).y+Q(x)=0$ by the Frobenius method, $x=0$ should be
(a) a regular singular point (b) an irregular singular point (c) an ordinary point (d) none

(xii) In Milne – Thomson's method, we replace x and y in $f(z)=u(x,y)+iv(x,y)$ respectively by
(a) $z,\bar{z}$ (b) $\bar{z},z$ (c) $z,0$ (d) $0,z$

2. Attempt any three parts of the following: **(3 X 4 = 12m)**

(a) Find the particular integral of the equation $(D^2-2D+1)y=e^{2x}$ where $D \equiv \frac{d}{dx}$.
(b) Show that $\beta(m,n)=\beta(n,m)$.
(c) Test the convergence of $\int_0^{\infty} \frac{dx}{1+x^2}$.
(d) Examine the nature of the series $1+2+3+\cdots+n+\cdots$

3. Attempt any three parts of the following: **(3 X 6 = 18m)**

(a) Solve $\frac{d^2y}{dx^2}+y=0$; given that $y(0)=2$ and $y\left(\frac{\pi}{2}\right)=-2$.
(b) Determine whether the function $f(z)=z^2+3$ is analytic or not.
(c) Find the Fourier series of the function $f(x)=x$ for $0<x<2\pi$.
(d)Evaluate $\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta$ using Beta and Gamma functions.

4. Attempt any two parts of the following: **(2 X 7 = 14m)**

(a) Show that $\int_0^{\infty} x^3e^{-x}\,dx=6$.
(b) Find p such that the function $f(z)$ expressed in polar coordinates as $f(z)=r^2\cos 2\theta+ir^2\sin p\theta$ is analytic.
(c) Solve $\frac{d^2y}{dx^2}+4y=\sin 3x+\cos 2x$.

5. Attempt any two parts of the following: **(2 X 7 = 14m)**

(a) Find the half – range sine series of $f(x)=\begin{cases}0 & ; 0<x<\frac{\pi}{2}\\ \pi-x; & \frac{\pi}{2}<x<\pi\end{cases}$.
(b) Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-4y=0$.
(c) Find the value of the integral $\int_C [(x+y)dx+x^2y\,dy]$ along $y=x^2$ having (0, 0) and (3, 9) as end points.

****