University of Mumbai

Examination 2020

Program: IT Engineering

Curriculum Scheme: Rev2016/2012

Examination: Second Year Semester III

Course Code: E401 and Course Name: Applied Mathematics III

Time: 1 hour　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

Q1.	$J_{\left(-\frac{1}{2}\right)}\left(x\right) = ...$ **(A)** $\sqrt{\frac{2}{\pi x}}\sin(x)$ **(B)** $\sqrt{\frac{2}{\pi x}}\left(\frac{\sin(x)}{x} - \cos(x)\right)$ **(C)** $-\sqrt{\frac{2}{\pi x}}\left(\frac{\cos(x)}{x} + \sin(x)\right)$ **(D)** $\sqrt{\frac{2}{\pi x}}\cos(x)$
Option A:	A
Option B:	B
Option C:	C
Option D:	D
Q2.	**Which of the following relation is correct for $J_n(x)$?** (A) $J_{n+1}(x) + J_{n-1}(x) = -\frac{2n}{x}J_n(x)$ (B) $J_{n+1}(x) - J_{n-1}(x) = \frac{2n}{x}J_n(x)$ (C) $J_{n+1}(x) + J_{n-1}(x) = \frac{2n}{x}J_n(x)$ (D) $J_{n+1}(x) + J_{n-1}(x) = \frac{2n}{x}J_{n-1}(x)$
Option A:	A
Option B:	B
Option C:	C
Option D:	D

Q3.	A function u is said to be harmonic if and only if (a) $u_{xx}+u_{yy}=0$ (b) $u_{xy}+u_{yx}=0$ (c) $u_x+u_y=0$ (d) $u_x^2+u_y^2=0$
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q4.	harmonic conjugate of $u(x,y)=e^{y}\cos x$ is (a) $e^{x}\cos y+C$ (b) $e^{x}\sin y+C$ (c) $e^{y}\sin x+C$ (d) $-e^{y}\sin x+C$
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q5.	**The gradient of a scalar function $\phi(x,y,z)$ is** (A) $\frac{\partial^2\phi}{\partial x^2}\hat{i}+\frac{\partial^2\phi}{\partial y^2}\hat{j}+\frac{\partial^2\phi}{\partial z^2}\hat{k}$ (B) $\frac{\partial\phi}{\partial x}+\frac{\partial\phi}{\partial y}+\frac{\partial\phi}{\partial z}$ (C) $\frac{\partial\phi}{\partial x}\hat{i}+\frac{\partial\phi}{\partial y}\hat{j}+\frac{\partial\phi}{\partial z}\hat{k}$ (D) $\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}+\frac{\partial^2\phi}{\partial z^2}$
Option A:	A
Option B:	B
Option C:	C
Option D:	D
Q6.	For what value of λ the vector field $\bar{V}=(2x^2y^2+z^2)\hat{i}+(3xy^3-x^2z)\hat{j}+(\lambda xy^2z+xy)\hat{k}$ is solenoidal?
Option A:	13
Option B:	9
Option C:	-13
Option D:	-9
Q7.	If the imaginary part of an analytic function $f(z)$ is $2xy+y$, then the real part is (a) x^2+y^2-y (b) x^2-y^2-x (c) x^2-y^2+x (d) x^2-y^2+y
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q8.	The harmonic conjugate of $2x-x^3+3xy^2$ is (a) $x-3x^2y+y^3$ (b) $2y-3x^2y+y^3$ (c) $y+3x^2y+y^3$ (d) $2y+3x^2y-y^3$
Option A:	a
Option B:	b
Option C:	c
Option D:	d

Q9.	The points at which $f(z)=\frac{(z^2-z)}{(z^2-3z+2)}$ is not analytic are (a) 0 and 1 (b) 1 and -1 (c) i and 2 (d) 1 and 2
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q10.	The harmonic conjugate of $u=\log\sqrt{x^2+y^2}$ is (a) $\frac{x}{x^2+y^2}$ (b) $\frac{y}{x^2+y^2}$ (c) $\tan^{-1}\left(\frac{x}{y}\right)$ (d) $\tan^{-1}\left(\frac{y}{x}\right)$
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q11.	There exist no analytic functions f such that (a) $\text{Re}\, f(z)=y-2x$ (b) $\text{Re}\, f(z)=y^2-2x$ (c) $\text{Re}\, f(z)=y^2-x^2$ (d) $\text{Re}\, f(z)=y-x$
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q12.	$L^{-1}\left[\log\frac{s^2+16}{\sqrt{s+3}}\right]$
Option A:	$\frac{1}{t}\left[\frac{1}{2}e^{3t}-2\cos 4t\right]$
Option B:	$\frac{1}{t}\left[\frac{1}{2}e^{2t}-2\cos 2t\right]$
Option C:	$\frac{1}{t}\left[\frac{1}{2}e^{3t}-2\cos 2t\right]$

Option D:	$\frac{1}{t}\left[\frac{1}{2}e^{3t} - 2\cos t\right]$
Q13.	Laplace of function f(t) is given by?
Option A:	$\int_0^{\infty} e^{t} f(t)\, dt$
Option B:	$\int_0^{\infty} e^{-st} f(t)\, dt$
Option C:	$\int_{-\infty}^{\infty} e^{-st} f(t)\, dt$
Option D:	$\int_{-\infty}^{\infty} e^{-t} f(t)\, dt$
Q14.	L[1 +sin 2t cos 2t]
Option A:	$\frac{s^2+2s+16}{s(s^2-4^2)}$
Option B:	$\frac{s^2+2s+16}{s(s^2+4^2)}$
Option C:	$\frac{s^2+2s+16}{(s^2-4^2)}$
Option D:	$\frac{s^2+2s+16}{(s^2+4^2)}$

Q15.	$L\left[te^{t}\sin t\right]$
Option A:	$\frac{s}{(s-2)^2+2}$
Option B:	$-\frac{d}{ds}\left(\frac{1}{(s-1)^2+1}\right)$
Option C:	$-\frac{d}{ds}\left(\frac{1}{(s-2)^2+1}\right)$
Option D:	$\frac{d}{ds}\left(\frac{s}{(s-1)^2+1}\right)$
Q16.	If L[y(t)] =Y(s), the L[y''(t)]=
Option A:	$s^2Y(s)-sy'(0)+y(0)$
Option B:	$s^2L[y(s)]-sy(0)+y'(0)$
Option C:	$s^2y(s)-sy(0)+y'(0)$
Option D:	$s^2Y(s)-sy(0)-y'(0)$
Q17.	What are periodic signals?
Option A:	The signals which change with time
Option B:	The signals which change with frequency
Option C:	The signal that repeats itself in time
Option D:	The signals that repeat itself over a fixed frequency
Q18.	$L^{-1}\left[\frac{s}{s^2a^2+b^2}\right]$

Option A:	$\frac{1}{a^2} cos(\frac{a}{b})t$
Option B:	$\frac{1}{a^2} cos(\frac{b}{a})t$
Option C:	$\frac{1}{a^2} sin(\frac{b}{a})t$
Option D:	$\frac{1}{a^2} sin(\frac{a}{b})t$
Q19.	$L^{-1}\left[\frac{2s-1}{s^2+4s+8}\right]$
Option A:	$2e^{-t}\cos 2t - \frac{5}{2}e^{-t}\sin 2t$
Option B:	$2e^{-t}\cos 2t - 5e^{-t}\sin 2t$
Option C:	$2e^{-2t}\cos 2t - 5e^{-2t}\sin 2t$
Option D:	$2e^{-2t}\cos 2t - \frac{5}{2}e^{-2t}\sin 2t$
Q20.	Find the value of b1 for xsin(x)in(0,pi)

Option A:	$\frac{\pi}{4}$
Option B:	$\frac{\pi}{2}$
Option C:	$\frac{\pi}{3}$
Option D:	$\frac{\pi}{12}$
Q21.	[redacted]
Option A:	a=2, b=1, c=1, d=2
Option B:	a=1, b=2, c=2, d=1
Option C:	a=2, b=-1, c=-1, d=2
Option D:	a=-2, b=1, c=1, d=-2
Q22.	If the real part of an analytic function $f(z)$ is x^2-y^2-y, then the imaginary part is (a) $2xy$ (b) x^2+2xy (c) $2xy-y$ (d) $2xy+x$
Option A:	a
Option B:	b
Option C:	c
Option D:	d
Q23.	If $f(x,y,z)=3x^2y+2y-3z,\ then\ \nabla f=$ (A) $(6x^2y, 3x^2, 3)$ (B) $(6xy, 3x^2+2, 3)$ (C) $(6xy, 3x^2, -3)$ (D) $(6xy, 3x^2+2, -3)$
Option A:	A
Option B:	B
Option C:	C
Option D:	D
Q24.	Let $\bar{F}=(y+z^3)\bar{i}+(x+2y)\bar{j}+(3xz^2)\bar{k}$ be a conservative field. Then the integral when C is any path joining A(1,1,1) and B(-1,2,0) is
Option A:	11
Option B:	-11

Option C:	5
Option D:	-5
Q25.	Which of the following represents the flux of $\vec{F} = M(x,y)\hat{i} + N(x,y)\hat{j}$? (A) $\int_C M\,dx + N\,dy$ (B) $\oint M\,dx + N\,dy$ (C) $\oint M\,dy - N\,dx$ (D) $\int_C M\,dx - N\,dy$
Option A:	A
Option B:	B
Option C:	C
Option D:	D