University of Mumbai
Examination 2020

Program: SE Comps/IT/Extc/Biomedical/Chemical/Biotech
Curriculum Scheme: Rev2012/R2016
Examination: Second Year SemesterIV
Course Name: Applied Mathematics-IV

DISCLAIMER

Below is sample paper only. Any resemblance to any question in final paper is purely coincidental.

NOTE: Q. No.1-3, 10-12 is strictly for Biotech Engg. only.
Q. No. 4 to 9 strictly for Biotech & Chemical Engg. only
Q.No.13 ,14 strictly for Chemical,Computer, EXTC &Biomedical Engg. Only.
Q. No. 15,16 strictly for Computer &Extc only.
Q. No.17,18 strictly for Computer Engg. Only.
Q. No. 19,20 strictly for Extc& Information Technology Engg. only.
Q.No.21-23 strictly for, Information Technology, Computer, EXTC &Biomedical Engg.
Q. No. 24 and 25 are strictly for Information Technology Engg. only.

Time: 1-hourMax. Marks: 50

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

Q1.	The one dimensional heat equation is
Option **A:**	$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$
Option B:	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$
Option C:	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial u}{\partial t}$
Option D:	$\frac{\partial u}{\partial t} = -c^2 \frac{\partial^2 u}{\partial x^2}$
Q2	The partial differential equation $\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial y^2} = 0$ is classified as
Option A:	Elliptic
Option B:	Parabolic
Option C:	Hyperbolic
Option D:	None of the above
Q3	A partial differential equation $A\frac{\partial^2 u}{\partial x^2} + B\frac{\partial^2 u}{\partial x \partial y} + C\frac{\partial^2 u}{\partial y^2} + D\frac{\partial u}{\partial x} + E\frac{\partial u}{\partial y} + Fu = 0$ is Parabolic if
Option A:	$B^2 - 4AC < 0$
Option B:	$B^2 - 4AC = 0$

Option C:	$B^2 - 4AC > 0$
Option D:	None of the above
Q4	The half range sine series for f(x) = $\frac{\pi}{4}$ in (0,π) is
Option A:	$\frac{\pi}{4} = \frac{1}{1} sinx + \frac{1}{3}$ sin3x+$\frac{1}{5}$ sin5x+….
Option B:	$\frac{\pi}{4} = \frac{1}{1} sinx - \frac{1}{3}$ sin3x+$\frac{1}{5}$ sin5x+….
Option C:	$\frac{\pi}{4} = \frac{1}{2} sin2x + \frac{1}{4}$ sin4x+$\frac{1}{6}$ sin6x+….
Option D:	$\frac{\pi}{4} = \frac{1}{2} sin2x - \frac{1}{4}$ sin4x+$\frac{1}{6}$ sin6x+….
Q5	To find the Fourier series of f(x) in [c,c+2l], the Fourier coefficient b_n is given by
Option A:	$\frac{1}{\pi}\int_0^{2\pi} f(x)cosnxdx$
Option B:	$\frac{1}{l}\int_c^{c+2l} f(x)\cos\left(\frac{n\pi x}{l}\right)dx$
Option C:	$\frac{1}{\pi}\int_0^{2\pi} f(x)sinnxdx$
Option D:	$\frac{1}{l}\int_c^{c+2l} f(x)\sin\left(\frac{n\pi x}{l}\right)dx$
Q6	If f(x) is defined in (c, c+2l) then the complex form of Fourier series is
Option A:	f(x)=$\sum_{-\infty}^{\infty} c_n e^{in\pi x/l}$, where $c_n = \frac{1}{2l}\int_c^{c+2l} f(x)e^{-in\pi x/l}dx$
Option B:	f(x)=$\sum_0^{\infty} c_n e^{in\pi x/l}$, where $c_n = \frac{1}{l}\int_0^{c+2l} f(x)e^{in\pi x/l}dx$
Option C:	f(x)=$\sum_0^{\infty} c_n e^{-in\pi x/l}$, where $c_n = \frac{1}{l}\int_0^{2\pi} f(x)e^{-in\pi x/l}dx$
Option D:	f(x)=$\sum_{-\infty}^{\infty} c_n e^{-in\pi x/l}$, where $c_n = \frac{1}{2l}\int_0^{2\pi} f(x)e^{in\pi x/l}dx$
Q7	A set of functions $f_1(x), f_2(x), f_3(x), \dots f_n(x)$…is said to be orthonormal on (a,b) if
Option A:	$\int_a^b f_m(x)\ f_n(x)dx = \begin{cases} 0 \ for\ m\neq n \\ \neq 0\ for\ m=n \end{cases}$
Option B:	$\int_a^b f_m(x)\ f_n(x)dx = \begin{cases} \neq 0 \ for\ m\neq n \\ 0\ for\ m=n \end{cases}$
Option C:	$\int_a^b f_m(x)\ f_n(x)dx = \begin{cases} 1 \ for\ m\neq n \\ 0\ for\ m=n \end{cases}$
Option D:	$\int_a^b f_m(x)\ f_n(x)dx = \begin{cases} 0 \ for\ m\neq n \\ 1\ for\ m=n \end{cases}$
Q8	If Fourier transform of f(x)=F(s) then the Fourier transform of f(x-a) is
Option A:	$e^{isa}F(s)$
Option B:	$e^{-sa}F(s)$
Option C:	$e^{-isa}F(s)$
Option D:	F(s-a)
Q9	If f(x) satisfies Dirichlet's conditions in each finite interval $-l \le x \le l$ and f(x)is integrable in -∞ to ∞ then Fourier Integral Theorem states that
Option A:	$f(s) = \frac{1}{\pi}\int_{\omega=0}^{\infty}\int_{s=-\infty}^{\infty} f(s)Cos\omega(s-x)d\omega ds$
Option B:	$f(s) = \frac{1}{\pi}\int_{s=0}^{\infty}\int_{\omega=-\infty}^{\infty} f(s)Cos\omega(s-x)d\omega ds$
Option C:	$f(x) = \frac{1}{\pi}\int_{s=0}^{\infty}\int_{\omega=-\infty}^{\infty} f(s)Cos\omega(s-x)d\omega ds$

Option D:	$f(x)=\frac{1}{\pi}\int_{\omega=0}^{\infty}\int_{s=-\infty}^{\infty}f(s)Cos\omega(s-x)d\omega ds$
Q10	The directional derivative of $\emptyset=xy^2+yz^3$ at the point (2,-1,1)in the direction of the vector $\hat{\imath}+2\hat{\jmath}\ +2\hat{k}$ is
Option A:	11
Option B:	-11
Option C:	11/3
Option D:	-11/3
Q11	The Gauss divergence theorem states that
Option A:	$\int\int_s \bar{N}\cdot\bar{F}\,ds=\int\int\int_v \nabla\cdot\bar{F}dv$ where $\bar{N}$ is a unit outward normal.
Option B:	$\int\int_s \nabla\cdot\bar{F}\,ds=\int\int\int_v \bar{N}\cdot\bar{F}dv$ where $\bar{N}$ is a unit outward normal.
Option C:	$\int\int_s \bar{\mathrm{N}}\cdot\nabla\times\bar{F}\,ds=\int\int\int_v \nabla\cdot\bar{F}dv$ where $\bar{N}$ is a unit outward normal.
Option D:	None of the above
Q12	If $\bar{F}=x^2\hat{\imath}$+xy$\hat{\jmath}$ and if c is a straight line joining (0,0) and (1,1) then $\int_c \bar{F}\cdot\overline{dr}$ is
Option A:	1/3
Option B:	2
Option C:	1
Option D:	2/3
Q13	Residue of f(z)= $\frac{1-e^{2z}}{z^4}$ at its pole is
Option A:	0
Option B:	4/3
Option C:	-4/3
Option D:	1
Q14	If C is the circle |z|=2 then $\int_c \frac{e^{3z}}{(z-\pi i)}dz$ is
Option A:	0
Option B:	πi
Option C:	$\frac{\pi i}{2}$
Option D:	$2\pi i$
Q15	For the matrix A=$\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$ the sum and product of its Eigen values is respectively
Option A:	5,-2
Option B:	-2,5
Option C:	-5,2
Option D:	2,-5
Q16	A square matrix is diagonalizable if and only if for every Eigen value of the matrix
Option A:	AM=GM +1
Option B:	AM=GM-1

Option C:	AM=GM
Option D:	None of the above
Q17	If there is an optimal solution to LPP then it exists at
Option A:	Extreme points
Option B:	Interior points
Option C:	Boundary points
Option D:	None of the above
Q18	A basic solution of a system is degenerated if
Option A:	Some basic variables are non zero
Option B:	Some basic variables are zero
Option C:	Some basic variables are negative
Option D:	Some basic variables are positive
Q19	The regression lines of sample are x+6y=6 and 3x+2y=10, then mean of x and y is
Option A:	$\bar{x} = 1/3 , \bar{y} = 1/2$
Option B:	$\bar{x} = 3 , \bar{y} = 1/2$
Option C:	$\bar{x} = 3 , \bar{y} = 2$
Option D:	$\bar{x} = 3 , \bar{y} = 4$
Q20	If x and y are independent then the coefficient of correlation is
Option A:	1
Option B:	-1
Option C:	0
Option D:	None of the above
Q21	Let 'X' be a continues random variable with pdf f(x)=kx(1-x) for $0\leq x \leq 1$, then 'k' is
Option A:	1/6
Option B:	6
Option C:	3
Option D:	3/2
Q22	If 'X' is a random variable with normal distribution and mean=10, standard deviation=4 then $P(X\leq 12)$ is
Option A:	0.6915
Option B:	0.7186
Option C:	0.5913
Option D:	0.8496
Q23	If r = number of rows = 4 and c= number of columns =6 then the degree of freedom of a chi-square distribution is
Option A:	24
Option B:	12
Option C:	15

Option D:	18
Q24	The inverse of 9 modulo 25 is
Option A:	14
Option B:	11
Option C:	18
Option D:	19
Q25	If $\emptyset$ is The Euler's Phi function then $\emptyset(90) =$
Option A:	11
Option B:	19
Option C:	89
Option D:	24