University of Mumbai
Examination 2020

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

DISCLAIMER

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

NOTE: Q. No. 5, 6, 8, 9 strictly for Biotech & Chemical Engg. only
Q. No.12,13,19,20 strictly for Biotech Engg. only.
Q.No.14 ,15 strictly for Computer, EXTC &Biomedical Engg. Only.
Q. No. 16 strictly for Biomedical & Extc only.
Q. No.21 strictly for Computer Engg. Only.
Q. No. 17,18 strictly for Extc & Biomedical Engg. & Computer(R2012) only.
Q. No. 22 to 25 strictly for Information Technology Engg. (R-2016) only.

Time: 1-hour Max. Marks: 50

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

Q1.	$L^{-1}\left\{\frac{10-4s}{(s-2)^2}\right\}$ is equal to
Option A:	$2(t-2)e^{2t}$
Option B:	$2(t+2)e^{2t}$
Option C:	$2(t-2)e^{-2t}$
Option D:	$2(t+2)e^{-2t}$
Q2.	The value of $\int_0^\infty e^{-3t} t \sin t \, dt$ is equal to
Option A:	6/5
Option B:	3/50
Option C:	0
Option D:	2/25
Q3.	$L\{t\,H(t-4)\}$ is equal to
Option A:	$e^{-4s}\left(\frac{1}{s^2}-\frac{4}{s}\right)$
Option B:	$e^{-4s}\left(\frac{1}{s^2}+\frac{4}{s}\right)$
Option C:	$e^{4s}\left(\frac{1}{s^2}-\frac{4}{s}\right)$
Option D:	$e^{4s}\left(\frac{1}{s^2}-\frac{4}{3s}\right)$
Q4.	Inverse Laplace Transform of $log\left(\frac{s+1}{s-1}\right)$
Option A:	$\frac{2sinht}{t}$
Option B:	$\frac{2cosht}{t}$
Option C:	$2tsinht$
Option D:	$2tcosht$

Q5.	The Coefficient of correlation between X and Y IS 0.6. and covariance is 4.8. The variance of X is 9. Then the Standard deviation of Y is
Option A:	$\frac{4.8}{3\ X\ 0.6}$
Option B:	$\frac{4.8}{9\ X\ 0.6}$
Option C:	$\frac{0.6}{3\ X\ 4.8}$
Option D:	$\frac{0.6}{9\ X\ 4.8}$
Q6.	If a random variable X follows Poisson distribution such that P(X=1)=2P(X=2), then mean of the distribution is
Option A:	4
Option B:	2
Option C:	3
Option D:	1
Q7.	Which of the following is true about regression coefficient
Option A:	If one of the coefficients of regression is greater than 1 the other must be less than 1.
Option B:	If one of the coefficients of regression is less than 1 the other must be equal to 1.
Option C:	If one of the coefficients of regression is greater than 1 the other must be equal to 1.
Option D:	Both the coefficient must be greater than 1.
Q8.	If $A = \begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$ then the Eigen value of $A^2 - 2A + 3I$ are
Option A:	$7\ and\ 13$
Option B:	$2\ and\ 3$
Option C:	$1\ and\ 4$
Option D:	$3\ and\ 12$
Q9.	Minimal polynomial of matrix A= $\begin{bmatrix} 2 & -3 & 3 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ is
Option A:	$f(x) = x^3 - 4x^2 + 3x - 4$
Option B:	$f(x) = x^3 - 6x^2 + 5x - 1$
Option C:	$f(x) = x^2 - 6x + 8$
Option D:	$f(x) = x^2 - 5x + 6$
Q10.	Which of the following is not true for an analytic function $f(z) = u + iv$
Option A:	u= constant and v = constant are orthogonal trajectories
Option B:	u and v are harmonic functions
Option C:	$f'(z) = u_x + iv_x$
Option D:	$u_x = v_y;\ u_y = v_x$
Q11.	The fixed points of the bilinear transformation $f(z) = w = \frac{z-1}{z+1}$, are
Option A:	$z = i, -i$
Option B:	$z = 1, -1$

Option C:	$z = 1, -i$
Option D:	$z = i, -1$
Q12.	The value of $\oint \frac{z+6}{z-2} dz$ over the circle $C: \|z\| = 1$
Option A:	$4\pi i$
Option B:	$-4\pi i$
Option C:	0
Option D:	$2\pi i$
Q13.	Which of the following is not true
Option A:	Taylor's series consists of positive integral powers of $(z - z_0)$
Option B:	Laurent's series consists of positive as well as negative powers of $(z - z_0)$
Option C:	Taylor's series consists of positive as well as negative integral powers of $(z - z_0)$
Option D:	The radius of convergence is the distance between the centre of Taylor's series and the nearest singularity of the function.
Q14.	Find the Fourier constant b_n for f(x)= x^2, where 0<x<2
Option A:	0
Option B:	$-\frac{4}{n\pi}$
Option C:	$-\frac{4}{n\pi^2}$
Option D:	$\frac{4}{n\pi}$
Q15.	The value of Fourier constant b_n in Half -range cosine series of f(x)= x, 0<x<2 is
Option A:	$\frac{4[(-1)^n-1]}{n^2\pi^2}$
Option B:	$\frac{4[(-1)^n+1]}{n^2\pi^2}$
Option C:	$-\frac{4[(-1)^n+1]}{n^2\pi^2}$
Option D:	$-\frac{4[(-1)^n-1]}{n^2\pi^2}$
Q16.	Which of the following is the correct for the Bessel's function $J_n(x)$
Option A:	$xJ_n'(x) = nJ_n(x) - xJ_{n+1}(x)$
Option B:	$xJ_n'(x) = nJ_{n+1}(x) - xJ_n(x)$
Option C:	$xJ_n'(x) = xJ_n(x) - nJ_{n+1}(x)$
Option D:	$nxJ_n'(x) = nJ_n(x) - xJ_{n+1}(x)$
Q17.	The divergence and curl of any vector point function are
Option A:	Both vector point function
Option B:	Both scalar point function
Option C:	Scalar and vector point function respectively
Option D:	Vector and Scalar point function respectively
Q18.	Which of the following is not true for Scalar Triple Product of three vectors $\bar{a}, \bar{b}, \bar{c}$
Option A:	$[\bar{a}, \bar{b}, \bar{c}] = [\bar{b}, \bar{c}, \bar{a}]$
Option B:	$[\bar{a}, \bar{b}, \bar{c}] = -[\bar{b}, \bar{a}, \bar{c}]$
Option C:	$[\bar{a}, \bar{a}, \bar{c}] = 0$

Option D:	$[\bar{a}, \bar{b}, \bar{c}] = -[\bar{b}, \bar{c}, \bar{a}]$
Q19.	The Lagrange's method of undetermined multipliers is used to solve
Option A:	NLPP with n variables and m(m<n) equality constraints
Option B:	NLPP with n variables and m(n<m) equality constraints
Option C:	NLPP with n variables and m(m<n) inequality constraints
Option D:	NLPP with n variables and m(n<m) inequality constraints
Q20.	For an NLPP with one inequality constraint, using Kuhn-Tucker conditions, what are the possible cases for the multiplier λ
Option A:	$\lambda = 0, \lambda \neq 0$
Option B:	$\lambda = 0$
Option C:	$\lambda \neq 0$
Option D:	$\lambda = 1, \lambda = -1$
Q21.	The Z-transform of x(n) is given by
Option A:	$\sum_{n=-\infty}^{\infty} x(n) z^{-n}$
Option B:	$\sum_{n=-\infty}^{\infty} x(n) z^{n}$
Option C:	$\sum_{n=0}^{\infty} x(n) z^{n}$
Option D:	None of the above
Q22.	If $f: R \to R, g: R \to R$ are defined by $f(x) = x + 2 \; and \; g(x) = x^2 \; then \; fogof \; =$
Option A:	$x^2 - 6x + 8$
Option B:	$x^2 + 6x + 8$
Option C:	$x^2 - 4x + 6$
Option D:	$x^2 + 4x + 6$
Q23.	Given A{1,2,3,4} B={x,y,z}, and let R be the relation, R={(1,y),(1,z),(3,y),(4,x),(4,z)} then Domain and Range of R is
Option A:	Domain of R={1,3,4}; Range of R={x,y,z}
Option B:	Domain of R={1,4}; Range of R={x,y,z}
Option C:	Domain of R={1,2,3,4}; Range of R={x,y,z}
Option D:	Domain of R={1,3,4}; Range of R={x,z}
Q24.	If 8 persons are chosen from any group, then how many of them will have the same birthday?
Option A:	At most 2
Option B:	Atleast 1
Option C:	Atleast 2
Option D:	none
Q25.	For any two sets which of the following is true?
Option A:	$\overline{A \cap B} = \bar{A} \cap \bar{B}$
Option B:	$\overline{A \cup B} = \bar{A} \cup \bar{B}$
Option C:	$A - B = \bar{A} \cup \bar{B}$
Option D:	$\overline{A \cap B} = \bar{A} \cup \bar{B}$