University of Mumbai
Examination 2020

Program: Computer Engineering
Curriculum Scheme: Rev2016
Examination: Second Year /Semester-IV
Course Code: CSC401 and Course Name: Applied mathematics-IV

Time: 2 hour Max. Marks: 80

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

Q1.	If $f(z) = \frac{z}{8-z^3}$ $, z = x + iy$, *then Residue of* $f(z)$ *at* $z = 2$ *is*
Option A:	$\frac{-1}{8}$
Option B:	$\frac{1}{8}$
Option C:	$\frac{-1}{6}$
Option D:	$\frac{1}{6}$
Q2.	The value of the integral $\oint \frac{cos(2\pi z)}{(2z-1)(z-3)}\, dz$ *where* C *is the circle* $\|z\| = 1$ *is*
Option A:	$-\pi i$
Option B:	$\frac{\pi i}{5}$
Option C:	$\frac{2\pi i}{5}$
Option D:	πi
Q3.	*The Analytic function* $f(z) = \frac{z-1}{z^2+1}$ *has Singularities at*
Option A:	1 and -1
Option B:	1 and i
Option C:	1 and -i
Option D:	**i and -i**

Q4.	$The\ value\ of\ \int_0^{2\pi} \frac{d\theta}{5+3\sin(\theta)}$ is
Option A:	$\frac{\pi}{2}$
Option B:	$\frac{\pi i}{2}$
Option C:	$\frac{\pi}{4}$
Option D:	$\frac{\pi i}{4}$
Q5.	Which of the following matrix is diagonalizable?
Option A:	$[1\ 2\ 0\ 1\ ]$
Option B:	$[2\ 4\ 0\ 3\ ]$
Option C:	$[2\ \ -\ 3\ 3\ 8\ ]$
Option D:	$[-\ 1\ \ -\ 2\ 2\ \ -\ 5\ ]$
Q6.	Suppose λ is an Eigenvalue of a non singular square matrix A . then
Option A:	$\frac{\lambda}{\lvert A\rvert}$ is an eigenvalue of adj A
Option B:	$\frac{1}{\lambda}$ is an eigenvalue of adj A
Option C:	λ is an eigenvalue of adj A .
Option D:	$\frac{\lvert A\rvert}{\lambda}$ **is an eigenvalue of adj A**
Q7.	For Matrix A=$[0\ 1\ 1\ 2\ 1\ 1\ 1\ 1\ 1\ ]$, A^{-1} $is\ given\ by$
Option A:	$A^2 - 2A$
Option B:	$A^2 + 2A + 3I$
Option C:	$A^2 - 2A - I$
Option D:	$A - 3I$

Q8.	*Find Stationary points for given NLPP* $Optimise\ z = x_1^2 + x_2^2 + x_3^2 - 6x_1 - 10x_2 - 14x_3 + 103$
Option A:	$x_1 = 3\ , x_2 = \ -5\ , x_3 = 7$
Option B:	$x_1 = 3\ , x_2 = \ 5\ , x_3 = 7$
Option C:	$x_1 = 2\ , x_2 = \ 5\ , x_3 =- 7$
Option D:	$x_1 =- 3\ , x_2 = \ 5\ , x_3 = 7$
Q9.	Find Eigenvalues of ($A^2 + 2A + 3I$) , where A=[1 1 1 0 2 1 0 0 3]
Option A:	5 , 20 , 19
Option B:	1 , 2 , 3
Option C:	4 , 12 ,16
Option D:	**5, 11 , 18**
Q10.	A Continuous random variable X has the p.d.f f(x)= k x^2 , $0 \leq x \leq 2$ Find $P(0.2 \leq X \leq 0.5)$
Option A:	0.243
Option B:	0.0021
Option C:	**0.0123**
Option D:	0.5632
Q11.	A Discrete random variable X has the following probability distribution

X	1	2	3	4	5	6	7
P(X=x)	K	2k	3k	k^2	$k^2 + k$	$2\ k^2$	$4\ k^2$

What is value of k ?

Option A:	$\frac{1}{2}$
Option B:	$\frac{1}{15}$
Option C:	$\frac{1}{8}$
Option D:	$\frac{2}{5}$
Q12.	Find E(X) for the probability density function f(x)= $\{k\left(x - x^2\right) \;, 0\le x\le 1 \; 0 \quad , elsewhere$
Option A:	$\frac{1}{3}$
Option B:	1
Option C:	$\frac{1}{2}$
Option D:	2
Q13.	A random variable X has Poisson Distribution. If 2 P(X=2) = P(X=1) + 2 P(X=0) Then the Variance of X is
Option A:	$\frac{3}{2}$
Option B:	2
Option C:	1
Option D:	$\frac{1}{2}$
Q14.	The range of test statistic-Z is:
Option A:	0 to 1
Option B:	-1 to +1
Option C:	0 to ∞
Option D:	**-∞ to +∞**

Q15.	Level of significance α lies between:
Option A:	-1 and +1
Option B:	**0 and 1**
Option C:	0 and n
Option D:	-∞ to +∞
Q16.	The number of independent values in a set of values is called:
Option A:	Test-statistic
Option B:	**Degree of freedom**
Option C:	Level of significance
Option D:	Level of confidence
Q17.	Which one of the following is correct Formula for χ^2-distribution
Option A:	$\chi^2 = \Sigma\left(\frac{(O-E)^2}{O}\right)$
Option B:	$\chi^2 = \Sigma\left(\frac{(E-O)^2}{O}\right)$
Option C:	$\chi^2 = \Sigma\left(\frac{(O-E)^2}{E}\right)$
Option D:	$\chi^2 = \Sigma\left(\frac{(O-E)^2}{E^2}\right)$
Q18.	In analyzing the results of an experiment involving seven paired samples, tabulated **t** should be obtained for:
Option A:	13 degrees of freedom
Option B:	12 degrees of freedom

Option C:	14 degrees of freedom
Option D:	**6 degrees of freedom**
Q19.	A Statement made about a population for testing purpose is called ?
Option A:	Statistic
Option B:	**Hypothesis**
Option C:	Level of Significance
Option D:	Test-Statistic
Q20.	Find the Standard form of given LPP $maximize\ z = 3x_1 + 5x_2$ $subject\ to\ 3x_1 + 2x_2 \leq 15\ ,\ 2x_1 - 5x_2 \geq -2\ \ and\ \ x_1, x_2 \geq 0$
Option A:	$maximize\ z = 3x_1 + 5x_2 + 0x_3 + 0x_4$ $subject\ to\ 3x_1 + 2x_2 + x_3 = 15\ ,\ -2x_1 + 5x_2 + x_4 = 2$ $and\ \ x_1, x_2, x_3, x_4 \geq 0$
Option B:	$maximize\ z = 3x_1 + 5x_2 + 0x_3 + 0x_4$ $subject\ to\ 3x_1 + 2x_2 + x_3 \geq 15\ ,\ -2x_1 + 5x_2 + x_4 \geq 2$ $and\ \ x_1, x_2, x_3, x_4 \geq 0$
Option C:	$minimize\ z = 3x_1 + 5x_2 + 0x_3 + 0x_4$ $subject\ to\ 3x_1 + 2x_2 + x_3 = 15\ ,\ -2x_1 + 5x_2 + x_4 = 2$ $and\ \ x_1, x_2, x_3, x_4 \geq 0$
Option D:	$maximize\ z = 3x_1 + 5x_2 + 0x_3 + 0x_4$ $subject\ to\ 3x_1 + 2x_2 + x_3 = 15\ ,\ -2x_1 + 5x_2 + x_4 = 2$ $and\ \ x_1, x_2 \geq 0$

Subjective/Descriptive questions

Q2 . (20 Marks Each)	**Solve any Four**	**5 marks each**

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1	The means of two random samples of sizes 9 and 7 are 196 and 199 respectively. The sum of the squares of the deviations from the mean is 27 and 19 respectively. Can the samples be regarded to have been drawn from the same normal population?
2	A)The mean breaking strength of cables supplied by a manufacturer is 1800 with S.D. 100. By a new technique in the manufacturing process it is claimed that the breaking strength of the cable has increased. In order to test the claim a sample of 50 cables are tested. It is found that the mean breaking strength is 1850. Can we support the claim at 1% LOS.
3.	Use the dual simplex method to solve the following L.P.P (8) Minimize : $z = 6x_1 + 3x_2 + 4\,x_3$ Subject to : $x_1 + 6x_2 + x_3 = 10$ $2x_1 + 3x_2 + x_3 = 15$ $x_1, x_2, x_3 \geq 0$
4	The proofs of a 500 page book contain 500 misprints. Find the probability that there are at least 4 misprints in a randomly chosen page.
5	Verify that the matrix $A = [1\ 2\ 3\ 2\ -1\ 4\ 3\ 1\ -1]$ satisfies the characteristic equation, Hence find A^{-2}
6	Obtain Laurent's series for $\frac{4z-3}{z(z-3)(z+2)}$ valid for $2<\|z\|<3$

Q3. (20 Marks Each)	**Solve any Four** **5 marks each**
i.	If the height of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches. Find the expected number of students having heights between 65 and 71 inches.
ii.	If X is binomially distributed with E(X)=2 and Var(X)=4/3. Find the probability distribution of X.
iii.	A machine is claimed to produce nails of mean length 5cms and standard deviation of 0.45cm. A random sample of 100 nails gave 5.1 as their average length. Does the performance of the machine justify the claim? Mention the level of significance you apply.

iv.	Find Eigen value and eigen vector of $A = [3\ -1\ 1\ 1\ -1\ 5\ -1\ 1\ 1\ -1\ 3\ ]$
v.	Evaluate $\int_0^{1+i} z^2 dz$ along (i) line $y = x$
vi.	*C) Use the dual simplex method to solve the following L.P.P (8)* *Minimize* $z = 2x_1 + x_2$ $Subject\ to\ 3x_1 + x_2 \geq 3$ $4x_1 + 3x_2 \geq 6$ $x_1 + 2x_2 \leq 3$ $x_1, x_2 \geq 0$