University of Mumbai
Examination 2020 under cluster ___ (Lead College Shortname)

Program: EXTC Engineering
Curriculum Scheme: Rev 2012
Examination: Second Year Semester IV
Course Code: ETS 401 and Course Name: Applied Mathematics IV

Time: 1 hour   Max. Marks: 50

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

Q1.	Find eigen values of $A^2 - 6A^{-1} + 3I$, $A = \begin{bmatrix} 6 & 0 & 0 \\ -6 & 3 & 0 \\ 2 & -4 & 1 \end{bmatrix}$
Option A:	36,10,-2
Option B:	38,10,-2
Option C:	-38,11,-2
Option D:	38,10,2
Q2.	Evaluate $\oint_c z^3 dz$ where C is a unit circle from $\theta = 0$ to $\theta = \pi$.
Option A:	0
Option B:	0.5
Option C:	2
Option D:	$\frac{1}{2}$
Q3.	Shortest distance between any two points in a plane is ______
Option A:	Straight Line
Option B:	Parabola
Option C:	Hyperbola
Option D:	Rectangular hyperbola
Q4.	Find mean and variance of Binomial distribution $(0.2 + 0.8)^{10}, q = 0.2$
Option A:	2,1.6
Option B:	8,1.6
Option C:	7,16
Option D:	2,8
Q5.	Given $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$, then
Option A:	A is derogatory and degree of minimal polynomial is 2
Option B:	A is non derogatory and degree of minimal polynomial is 3
Option C:	A is non derogatory and degree of minimal polynomial is 2
Option D:	A is derogatory and degree of minimal polynomial is 3

Q6.	Evaluate $\int_c \frac{2z-6}{(z-2)(z-5)}dz$ where c is the circle $\lvert z\rvert=\frac{1}{2}$
Option A:	0
Option B:	$2\pi i$
Option C:	$-2\pi i$
Option D:	$-4\pi i$
Q7.	Find vector orthogonal to both $u=(-6,4,2)$ & $v=(3,1,5)$
Option A:	$(-1,2,-1)$
Option B:	$(1,2,1)$
Option C:	$(1,2,-1)$
Option D:	$(1,-2,-1)$
Q8.	Find characteristic equation of , $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 2 & 2\end{bmatrix}$
Option A:	$\lambda^3+5\lambda^2+7\lambda-3=0$
Option B:	$\lambda^3-5\lambda^2+7\lambda-3=0$
Option C:	$\lambda^3-5\lambda^2+7\lambda+3=0$
Option D:	$\lambda^3-5\lambda^2-7\lambda-3=0$
Q9.	X is a Poisson Variate such that $P[X=2]=P[X=3]$ then variance of X is
Option A:	0
Option B:	3
Option C:	1
Option D:	5
Q10.	Find poles of function $\frac{1}{z\cos z}$.
Option A:	0
Option B:	$n\pi$ for $n=0, \pm1, \pm2,....$
Option C:	$\frac{n\pi}{2}$ for $n=0, \pm1, \pm2,....$
Option D:	$0, \frac{(2n+1)\pi}{2}$ for $n=0, \pm1, \pm2,....$
Q11.	A random variable X has a probability density function $f(x)=x^2e^{-x}; x\geq 0$. Then Mean of X is
Option A:	12
Option B:	6
Option C:	3
Option D:	4

Q12.	Using Cayley Hamilton Theorem Find A^{-1}in terms of$A$, $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & -5 \\ 0 & 0 & 1 \end{bmatrix}$
Option A:	$\frac{1}{5}(A^2 + 3A + 3I)$
Option B:	$\frac{1}{5}(-A^2 - 3A + 3I)$
Option C:	$\frac{1}{5}(-A^2 + 3A - 3I)$
Option D:	$\frac{1}{5}(-A^2 + 3A + 3I)$
Q13.	Using applications of residue theorem, $\int_0^{2\pi} \frac{d\theta}{2+5\sin\theta} =$ ___________
Option A:	$\int_c \frac{2dz}{2z^2+4iz+5}$ where c is $\lvert z\rvert=1$
Option B:	$\int_c \frac{2dz}{5z^2+4iz-5}$where c is $\lvert z\rvert=1$
Option C:	$\int_c \frac{2dz}{3z^2+10iz-3}$where c is $\lvert z\rvert=1$
Option D:	$\int_c \frac{dz}{2z^2+10iz-2}$where c is $\lvert z\rvert=1$
Q14.	Find eigen values of $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$
Option A:	1,2
Option B:	0,5
Option C:	5,1
Option D:	0,1
Q15.	Find the extremals of $\int_{x_1}^{x_2}(1 + y')y'dx$.
Option A:	$2y = C_1x + C_2$
Option B:	$3y = C_1x + C_2$
Option C:	$y = C_12x + C_2$
Option D:	$2y = C_12x + C_2$
Q16.	A random variable X has a probability mass function $p(x) = kx^3$; $x = 1,2,3,4$. Then k is
Option A:	1/10
Option B:	1/30
Option C:	1/100
Option D:	1
Q17.	Four unbiased coins are tossed 160 times The expected frequencies of getting {0,1,2,3,4} heads are respectively

Option A:	0,10,20,30,40
Option B:	20,40,60,80,40
Option C:	20,30,60,30,20
Option D:	10,40,60,40,10
Q18.	Evaluate $\int_c \frac{zdz}{(z-1)(z-2)}dz$ where c is the circle $\lvert z\rvert = 3$
Option A:	$2\pi i$
Option B:	$6\pi i$
Option C:	$4\pi i$
Option D:	$-2\pi i$
Q19.	Find k if probability distribution function is given as $f(x) = \begin{cases} k.x^2 for\ 0 \le x \le 2. \\ 0 \qquad otherwise \end{cases}$
Option A:	8/3
Option B:	8
Option C:	3/8
Option D:	¾
Q20.	Find 5^A, $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$
Option A:	$\begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$
Option B:	$\begin{bmatrix} 5 & 0 \\ 0 & 25 \end{bmatrix}$
Option C:	$\begin{bmatrix} 5 & 1 \\ 0 & 25 \end{bmatrix}$
Option D:	$\begin{bmatrix} 25 & 0 \\ 0 & 5 \end{bmatrix}$
Q21.	Find the angle between $u = (2, -1,1)$ & $v = (1,1,2)$
Option A:	$\frac{\pi}{6}$
Option B:	$\frac{\pi}{3}$
Option C:	0
Option D:	$\frac{\pi}{2}$
Q22.	Find additive identity of vector space defined as $\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$.
Option A:	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
Option B:	0
Option C:	$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

Q23.	X is normally distributed variable with mean 30 and standard deviation 4, find P(X<40). (Given: Area between Z=0 to Z=2.5 is 0.4938.)
Option A:	0.9878
Option B:	0.4878
Option C:	0.9938
Option D:	0.0062
Q24.	Find orthogonal basis of R^2 $of\ S = \{(3,1),(2,2)\}$
Option A:	$\left\{(3,1),\left(-\frac{2}{5},\frac{6}{5}\right)\right\}$
Option B:	$\left\{(3,1),\left(\frac{2}{5},\frac{6}{5}\right)\right\}$
Option C:	$\left\{(3,1),\left(-\frac{2}{5},-\frac{6}{5}\right)\right\}$
Option D:	$\left\{(3,1),\left(-\frac{3}{5},\frac{6}{5}\right)\right\}$
Q25.	Find matrix associated with the following quadratic form $x_1^2+4x_2^2+3x_3^2+2x_2x_3-2x_1x_3+4x_1x_2$
Option A:	$\begin{bmatrix} 1 & 2 & -1 \\ 2 & 4 & 1 \\ -1 & 1 & 3 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & -1 \\ 1 & -1 & 3 \end{bmatrix}$
Option C:	$\begin{bmatrix} 1 & 2 & -1 \\ 4 & 2 & 1 \\ 3 & -1 & 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 & -1 & 2 \\ -2 & 4 & 1 \\ -1 & 1 & 3 \end{bmatrix}$