University of Mumbai
Examination 2020

Program: BE Mechanical Engineering

Curriculum Scheme: Revised 2016

Examination: Second Year Semester III

Course Code: **MEC401** and Course Name: Applied Mathematics IV

Time: 1 hour   Max. Marks: 50

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

Q1.	Find 4^A if A = $\begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$.
Option A:	$\begin{bmatrix} 10 & 6 \\ 6 & 10 \end{bmatrix}$
Option B:	$\begin{bmatrix} 10 & -6 \\ 6 & 2 \end{bmatrix}$
Option C:	$\begin{bmatrix} 2 & 65 \\ 6 & 10 \end{bmatrix}$
Option D:	$\begin{bmatrix} -9 & 6 \\ 20 & 1 \end{bmatrix}$
Q2.	Find Eigen values of A^3 + I where A = $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$
Option A:	2, 2, 125
Option B:	9, 6, 20
Option C:	25, 1, 1
Option D:	126, 2, 2
Q3.	If A = $\begin{bmatrix} 1 & 2 & 3 \\ -1 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ then find $A^9 - 6A^8 + 10A^7 - 3A^6 + A + I$
Option A:	A - I
Option B:	A + I
Option C:	2A
Option D:	A^2

Q4.	Find 5^A if A = $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$.
Option A:	$\begin{bmatrix} 325 & -300 \\ 300 & 325 \end{bmatrix}$
Option B:	$\begin{bmatrix} 325 & 100 \\ 100 & 325 \end{bmatrix}$
Option C:	$\begin{bmatrix} 325 & 300 \\ 300 & 325 \end{bmatrix}$
Option D:	$\begin{bmatrix} 125 & 300 \\ 300 & 125 \end{bmatrix}$
Q5.	Find Eigen values of $A^3 + 4 A^{-1}$ where A = $\begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$
Option A:	5, 65
Option B:	2, 20
Option C:	5, 60
Option D:	3, 20
Q6.	Verify the matrix A = $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$ is non-derogatory or derogatory
Option A:	Derogatory
Option B:	Non derogatory
Q7.	The probability distribution of random variable is given by

X	0	10	15
P(x)	(k-6)/5	2/k	14/5k

Find (i) K (ii) Mean and variance.

Option A:	K = 8, M=3.32, V = 20
Option B:	K = 6, M=7.75, V = 43.6875
Option C:	K = 8, M=1.23, V = 2.16
Option D:	K = 8, M=7.75, V = 43.6875
Q8.	A pdf of random variable is defined as $f(x) = 6(x-x^2)$, $0 < x < 1$. Then find mean and variance.
Option A:	M=0.5, V=3
Option B:	M=0.9, V=0.05
Option C:	M=0.5, V=0.05
Option D:	M=3, V=0.05

Q9.	A transmission channel has per digit error probability 0.01. Calculate the probability of more than 1 error in 10 received using Poisson distribution.
Option A:	0.0025
Option B:	0.26
Option C:	0.4856
Option D:	0.0047
Q10.	Assume the mean height of soldiers to be 172 cms with a s. d. 5 cms. How many soldiers in a regiment of 1000 have height greater than 180 cms?
Option A:	55
Option B:	89
Option C:	70
Option D:	123
Q11.	*From the following table test whether the color of son's eye is associated with that of the father's.*

Eye colour of fathers	Eye colour of sons	
	Not light	*light*
Not light	*48*	*90*
light	*80*	*782*

Option A:	X^2 Computed = 66.88, Not Associated
Option B:	X^2 Computed = 100, Associated
Option C:	X^2 Computed = 66.88, Associated
Option D:	X^2 Computed = 100, Not Associated
Q12.	In a collage entrance examination taken by 2000 students, the average marks scored by 36 randomly selected boys was 72 with S. D. of 8, while the average score of a sample of 36 girls was 70 with S D. of 6. Test at 1% los, the hypothesis that girls perform better in competitive examination.
Option A:	Z computed = 20, H0 Accepted
Option B:	Z computed = 1.15, H0 Rejected
Option C:	Z computed = 1.15, H0 Accepted
Option D:	Z computed = 3, H0 Accepted
Q13.	The nicotine contents in milligrams in two samples of tobacco were found to be as follows:

Sample A	19	17	15	21	16	18	16	14

	Sample B	15	14	15	19	15	18	16	

Can it be said that two samples come from same normal population?

Option A:	t Computed = 0.93, H0 Rejected
Option B:	t Computed = 2.33, H0 Accepted
Option C:	t Computed = 6, H0 Rejected
Option D:	t Computed = 0.93, H0 Accepted

Q14.	Solve the following LLP by simplex method.
	Maximize Z = 4 x + 10y
	Subject to: 2x + y ≤ 50
	             2x + 5 y ≤ 100
	             2x + 3 y ≤ 90
	                x, y ≥ 0.

Option A:	X= 0, y= 20, z max = 20
Option B:	X= 0, y= 20, z max = 200
Option C:	X= 10, y= 20, z max = 200
Option D:	X=30, y= 20, z max = 200
Q15.	Two random samples gave the following information:

sample	size	Sample mean	Sum of square of deviation from the mean
1	13	18	100
2	21	24	150

Test the significance of variance.

Option A:	F Comp. = 1.11, H0 Accepted
Option B:	F Comp. = 1.11, H0 Rejected
Option C:	F Comp. = 2.16, H0 Rejected
Option D:	F Comp. = 15, H0 Rejected
Q16.	If F= (ax + 3y +4z)i+(x-2y + 3z)j+(3x+2y-z)k is solenoidal, then find value of a
Option A:	3
Option B:	-3
Option C:	2
Option D:	-2
Q17.	*Find a, b, c if f is irrotational* *F= (axy+bz^3)i+(3x^2-cz)j + (3xz^2 − y)k*
Option A:	a=- 6, b= -1, c=1
Option B:	a= 6, b= -1, c=2
Option C:	a= 6, b= -8, c=1
Option D:	a= 6, b= -1, c=1

Q18.	Evaluate by Greens theorem $$\int_c (x^2 - xy)dx + (x^2 - y^2)dy$$ C: x² = 2y and x = y.
Option A:	-2
Option B:	30
Option C:	2
Option D:	15
Q19.	Use gauss divergence theorm to evaluate $\iint N.Fds$, where $F=x^2i+zj+yzk$, over the region bdd by x=0, y=0, z=0, y=3, x=1, y=1, z=1.
Option A:	3/2
Option B:	-3/2
Option C:	15
Option D:	1/2
Q20.	A random sample of 16 observations has mean 103.75c ms. The sum of squares of the deviations from the mean is 843.75 cms. Can this sample be regarded as coming from the population having 108.75 cm as the mean?
Option A:	t comp. = 2.67, H0 Rejected
Option B:	t comp. = 2.67, H0 Accepted
Option C:	t comp. = 12.36, H0 Rejected
Option D:	t comp. = 12.67, H0 Rejected
Q21.	The heights of 10 males of a given locality are found to be 63, 63, 64, 65, 66, 69, 69, 70, 70, 71 inches, Is it reasonable to believe that the average height is greater than 65 inches?
Option A:	t comp. = 2.67, H0 Rejected
Option B:	t comp. = 2.02, H0 Accepted
Option C:	t comp. = 2.67, H0 accepted
Option D:	t comp. =12.67, H0 Rejected
Q22.	Use Stokes theorm to evaluate $\int_c \bar{F}.dr$, where $F=x^2i+xyj$, over the region bdd by x=0, y=0, y=b, x =a.
Option A:	-ab/2
Option B:	-ab²/2
Option C:	ab²/2
Option D:	ab²

Q23.	If F= (x + 3y)i+(y - 2z)j+(az+x)k is solenoidal, then find value of a
Option A:	2
Option B:	-2
Option C:	3
Option D:	-3
Q24.	*Based on the following data determine if there is a relation between literacy and smoking*
Option A:	X^2 Computed = 66.88, H0 Accepted
Option B:	X^2 Computed = 100, H0 Accepted
Option C:	X^2 Computed = 66.88, H0 Rejected
Option D:	X^2 Computed = 9.19, H0 Accepted
Q25.	Find E(x) where X is number of heads appeared when three coins were tossed
Option A:	20
Option B:	1.5
Option C:	3
Option D:	6.8

For Q24:

	smokers	Non smokers
Literates	*83*	*57*
Illiterates	*45*	*68*