Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

TEST – 1

Sem & AY: Odd Sem 2019-20 **Date:** 27.09.2019

Course Code: MAT 110 **Time:** 9.30AM to 10.30AM

Course Name: APPLIED MATHEMATICS **Max Marks:** 30

Program & Sem: BCA & I **Weightage:** 15%

Instructions:

(i) *Read the question properly and answer accordingly.*

(ii) *Question paper consists of 3 parts.*

(iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries two marks (3Qx2M=6M)

1. A tree of 50 ft tall casts a shadow 138 ft long. Identify the angle of elevation of the sun.

(C.O.NO.1) [Comprehension]

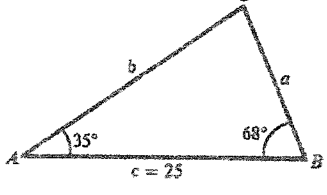
2. State Maclaurin's theorem for a function $f(x)$. (C.O.NO.2) [Knowledge]
3. State Cauchy's mean value theorem. (C.O.NO.2) [knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries four marks. (3Qx4M=12M)

4. Solve the triangle ABC, given c = 25, $\angle A = 35$ and $\angle B = 68$ as in the figure below

(C.O.NO.2) [Application]



5. Verify Lagrange's mean value theorem for e^x in $(0,1)$. (C.O.NO.2) [Comprehension]

6. Express $\log(\cos x)$ as Maclaurin's series up to third degree term.

(C.O.NO.2) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries six marks. (2Qx6M=12M)

7. Verify Rolle's mean value theorem for the function $f(x) = (x+2)^3(x-3)^4$ in $(-2,3)$ (C.O.NO.2) [Comprehension]

8. Express $4x^3 + 7x^2 + 3x - 4$ as a Taylor series expansion in the powers of $(x-2)$.

(C.O.NO.2) [Comprehension]

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

TEST – 1

Date: 27.09.2019
Time: 1 Hr
Max Marks: 30 Marks
Weightage: 15%

Semester I sem
Course Code: MAT 110
Course Name:Applied Mathematics

Extract of question distribution [outcome wise & level wise]

Q.NO	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K	C	A	K	C	A	K	C	A	
1	1	Module 1 / Trigonometry	2									2
2	2	Module 2 / Calculus	2									2
3	3	Module 2 / Calculus		2								2
4	4	Module 1 / Trigonometry						4				4
5	5	Module 2 / Calculus					4					4

6	6	Module 2 / Calculus					4					4
7	7	Module 1 / Trigonometry									6	6
8	8	Module 2 / Calculus								6		6
9	9	Module 2 / Calculus								6		6
	Total Marks		4	2	0	0	8	4	0	12	6	36

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

[I hereby certify that All the questions are set as per the above guide lines. Mr. Sandeep Kumar]

Reviewers' Comments

SCHOOL OF INFORMATION SCIENCE

SOLUTION

Semester: 1 Sem

Course Code: MAT 110

Course Name: Applied Mathematics

Date: 20.09.2019

Time: 1 hr

Max Marks:30 Marks

Weightage: 15 %

Part A (Q x M = Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	Recalling $\tan\theta$ To get the answer as $\theta = 20$	1 M 1M	4 Mins
2	Statement : $f(x) = f(0) + \frac{\lambda}{1!} f'(0) + \frac{(x)^2}{2!} f''(0) + \frac{(x)^3}{3!} f'''(0) + \cdots$	2 M	4 Mins
3	If f(x) and g(x)is continuous in [a.b], differentiable in (ab), then there exists $c \in (a, b)\ \lambda \quad f'(c) = \frac{f(b)-f(a)}{g(b)-g(a)}$	2 M	4 Mins

Part B(Q x M = Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
4	To calculate C = 77 Sine rule Formula To find a= 15 To find b = 24	1M 1M 1M 1M	8 Mins
5	To state Lagrange's theorem To find c= $\frac{a+b}{2}$	2M 2M	8 Mins
6	Series formula Finding four derivatives Writing the final series	1M 2M 1M	8 Mins

Part C (Q x M = Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question

7	Evaluating the identity	6M	12 mins
8	Cauchy's theorem statement Finding derivatives Finding $c = 0$	2M 2M 2M	12 mins
9	Power series Statement : $f(x) = f(a) + \frac{x-a}{1!} f'(a) + \frac{(x-a)^2}{2!} f''(a) + \frac{(x-a)^3}{3!} f'''(a) + \cdots$ Finding the derivatives at $x=1$ $\log x = -4 + 74(x-2) - \frac{41(x-2)^2}{2} + 24\frac{(x-1)^3}{3!}$	2M 2M 2M	12 mins

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GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

TEST – 2

Sem & AY: Odd Sem. 2019-20
Course Code: MAT 110
Course Name: APPLIED MATHEMATICS
Program & Sem: BCA & I

Date: 16.11.2019
Time: 9:30 AM to 10:30 AM
Max Marks: 30
Weightage: 15 %

Instructions:

I. Read the question properly and answer accordingly.
II. Question paper consists of 3 parts.
III. Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer both the Questions. Each Question carries two marks. (2Qx2M=4M)

1. Derive the n^{th} derivative of $y = e^{ax}$. (C.O.NO.2) [Comprehension]
2. Find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ for the function $u = x^3 + e^x \sin y$. (C.O.NO.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer both the Questions. Each Question carries five marks. (2Qx5M=10M)

3. If $U = \frac{x^3 + y^3}{x-y}$ show that $x\frac{\partial U}{\partial x} + y\frac{\partial U}{\partial y} = 2U$ (C.O.NO.2) [Knowledge]
4. Evaluate $\lim_{x\to 0} \frac{xe^x - log(x+3)}{x^2}$. (C.O.NO.2) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries eight marks. (2Qx8M=16M)

5. If $y = e^{m\,cos^{-1}x}$ show that (C.O.NO.2) [Application]

$$(1 - x^2)y_{n+2} - (2n - 1)xy_{n-1} - (n^2 + m^2)y_n = 0$$

6. Find Jacobian of $U = xy^2, V = yz^2, W = x^2z$ (C.O.NO.2) [Comprehension]

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

TEST – 2

Semester: I sem
Course Code: MAT 110
Course Name: Applied Mathematics

Date: 16.11.2019
Time: 1 Hr
Max Marks: 30 Marks
Weightage: 15%

Extract of question distribution [outcome wise & level wise]

Q.NO	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K	C	A	K	C	A	K	C	A	
1	2	Module 2 / Calculus		2								2
2	2	Module 2 / Calculus	2									2
3	2	Module 2 / Calculus				5						5
4	2	Module 2 / Calculus					5					5
5	2	Module 2 / Calculus									8	8
6	6	Module 2 / Calculus								8		8
	Total Marks		2	2	0	5	5	0	0	8	8	30

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

SCHOOL OF INFORMATION SCIENCE

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SOLUTION

Semester: 1 Sem

Course Code: MAT 110

Course Name: Applied Mathematics

Date: 20.09.2019

Time: 1 hr

Max Marks:30 Marks

Weightage: 15 %

Part A

(2Q x2 M = 4Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	Differentiating two times Concluding to standard form	**1 M** **1M**	**4 Mins**
2	Finding partial derivative wrt x Finding partial derivative wrt y	**1 M** **1M**	**4 Mins**

Part B(2Q x5 M = 10 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
3	Finding partial derivative wrt x Finding partial derivative wrt y Evaluating and simplifying	1M 1M 3M	**10 Mins**
4	To state the given problem is indeterminate Applying L'Hopital's rule for 2 times to get the answer as 1/2	1M 2+2M	**10 Mins**

Part C

(2Q x8 M = 16 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
5	To find the 2^{nd} derivative Applying Leibnitz theorem Simplifying to get the required answer	2M 4 M 2M	**16 Mins**
6	Finding the partial derivative of U, V, W wrt x, y, z Substituting in determinate and simplifying	6M 2M	**16 Mins**

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

END TERM FINAL EXAMINATION

Semester: Odd Semester: 2019-20
Course Code: MAT110
Course Name: APPLIED MATHEMATICS
Program &Sem: BCA & I

Date: 30 December 2019
Time: 1:00 PM to 4.00 PM
Max Marks: 100
Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each Question carries 2 marks. **(10Qx2M=20M)**

1. By law of cosines $a^2 =$ ________, $b^2 =$ ___________

(C.O.No.1) [Knowledge]

2. In an equilateral ~~triangle, sum~~ of all angles is ________ and all sides are _______

(C.O.No.1) [Knowledge]

3. Rolle's mean value theorem states that if (i) $f(x)$ is continuous in ____ (ii).differentiable in ____ (iii) ______ then there exists at least one value 'c' in (a,b) such that___

(C.O.No.2) [Knowledge]

4. $\lim_{x \to 0} \frac{\cos x - 1}{2x^2} =$___________ (C.O.No.2) [Comprehension]

5. If $z = e^x \sin y$ then $\frac{\partial z}{\partial x}$ = _____ and $\frac{\partial z}{\partial y}$ = _____ (C.O.No.2) [Knowledge]

6. If $u = \frac{x^4 + y^4}{x^2 + y^2}$, then by Euler's theorem $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$ _______

(C.O.No.2) [Knowledge]

7. $\int_0^{\pi/2} \sin^4 x \, dx =$ _______________ (C.O.No.3) [Knowledge]

8. Rank of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 6 & 9 \end{bmatrix} =$ ________ (C.O.No.4) [Knowledge]

9. Eigen values of a matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ are______ (C.O.No.4) [Knowledge]

10. Characteristic equation of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ is ______ (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 10 marks **(5Qx10M=50M)**

11. (i). Using Taylor's expansion expand $\tan x$ in powers of $\left(x-\frac{\pi}{2}\right)$

[6M] (C.O.No.2) [Knowledge]

(ii). Using Maclaurin's series expand $\cos 2x$

[4M] (C.O.No.2) [Knowledge]

12. Find the $J\left(\frac{u,v,w}{x,y,z}\right)$ for the function $u=\frac{x}{y}, v=\frac{y}{z}, w=\frac{z}{x}$

(C.O.No.2) [Knowledge]

13. Evaluate $\lim_{x\to 0} \frac{2\sin x-\sin 2x}{x^3}$

(C.O.No.2) [Knowledge]

14. Verify Cayley Hamilton theorem and find A^{-1} for the matrix

$$\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$$

(C.O.No.4) [Comprehension]

15. Solve the following system of equations using Gauss elimination method and Gauss Jordan method

$$x+y+z=9, \quad x-2y+3z=8, \quad 2x+y-z=3$$

(C.O.No.4) [Comprehension]

Part C [Problem Solving Questions]

Answer both the Questions. Each Question carries 15 marks. **(2Qx15M=30M)**

16. (i) . Evaluate $\int \frac{5}{(x-2)(x+3)}\, dx$ [8M] (C.O.No.3) [Comprehension]

(ii) Evaluate $\int x^2 \sin x\, dx$ [7M](C.O.No.3) [Comprehension]

17. Find all the eigen values and the corresponding eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

(C.O.No.4) [Knowledge]

SCHOOL OFENGINEERING

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

END TERM FINAL EXAMINATION

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO (% age of CO)	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K	C	A	K	C	A	K	C	A	
1	1	1	2M									2M
2	1	1		2M								2M
3	2	2	2M									2M
4	2	2	2M									2M
5	3	3		2M								2M
6	3	3	2M									2M
7	4	4	2M									2M
8	4	4	2M									2M
9	5	5	2M									2M
10	5	5	2M									2M
11	1	1				10M						10M
12	2	2				10M						10M
13	3	3				10M						10M
14	4	4					10M					10M
15	5	5					10M					10M
16	3	3								15M		15M
17	5	5							15M			15M
	Total Marks		16M	4M		30M	20M		15M	15M		100M

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines.

Faculty Signature:

Reviewer Commend:

Format of Answer Scheme

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OFENGINEERING

SOLUTION

Semester: Odd Sem. 2019-20

Course Code: MAT110

Course Name: APPLIED MATHEMATICS

Program &Sem: BCA (All Programs) & I

Date: 03.01.2020

Time: 3 HRS

Max Marks: 100

Weightage: 50%

Part A (10Q x 2M = 20Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	$a^2 = b^2 + c^2 - 2bc\cos A\,, b^2 = a^2 + c^2 - 2ac\cos B,$	2M	4 Minutes
2	180 , $equal$	2M	4 Minutes
3	[a,b], (a,b), f(a)=f(b), f'(c)=0	2M	4 Minutes
4	-1/4	2M	4 Minutes
5	$e^x \sin y,\ \ e^x \cos y$	2M	4 Minutes
6	$2z$	2M	3 Minutes
7	$\frac{3\sqrt{\pi}}{8}$	2M	4 Minutes
8	2	2M	4 Minutes

9	1, 2	2M	4 Minutes
10	$\lambda^2 - 3\lambda - 10 = 0$	2M	4 Minutes

Part B (5Q x 10M = 50 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
11 (i)	i). Taylor's series about the point $x=1$ $f(x)=f\left(\frac{\pi}{4}\right)+(x-1)f'(1)+\frac{(x-1)^2}{2!}f'(1)+.....$ $f(1)=0, f'(1)=1, f''(1)=-1, f'''(1)=2$ $f(x)=(x-1)+\frac{1}{2}(x-1)^2+\frac{1}{6}(x-1)^3$	2 Marks 3 Marks 1 Marks	6Minutes
11 (ii)	b. Maclaurin's series $f(x)=f(0)+xf'(0)+\frac{x^2}{2!}f''(0)+.....$ $f(0)=0, f'(0)=2, f''(0)=-4, f'''(0)=-8, f^{iv}(0)=16...$ $f(x)=2x-2x^2-\frac{4x^3}{3}+\frac{16x^4}{24}$	1 Mark 2 Marks 1 Mark	4 Minutes
12	Finding partial derivatives Writing the detereminate Expanding the determinate to get the answer 0	3 Marks 2 Marks 5 Marks	15 Minutes
13	Showing the problem as (0/0) form Differentiating 3 times Final substitution and getting the answer as 4/3	1 marks 6 marks 3marks	15 Minutes
14	Verification of Caley Hamilton theorem Finding inverse of A	5 Mark 5 Marks	15 Minutes
15	$[A:B]=\begin{bmatrix}1 & 1 & 9 & :9\\ 1 & -2 & 3 & :8\\ 2 & 1 & -1 & :3\end{bmatrix}$, $\square \begin{bmatrix}1 & 1 & 9 & :9\\ 0 & -3 & 2 & :-1\\ 0 & -1 & -3 & :-15\end{bmatrix}$ $\square \begin{bmatrix}1 & 1 & 9 & :9\\ 0 & -3 & 2 & :-1\\ 0 & 0 & -11 & :-44\end{bmatrix}$, $\left.\begin{matrix}x+y+z=9\\ -3y+2z=-1\\ -11z=-44\end{matrix}\right\}$ $x=2, y=3, z=4$ $\square \begin{bmatrix}3 & 0 & 9 & :9\\ 0 & -3 & 2 & :-1\\ 0 & 0 & 1 & :4\end{bmatrix} \square \begin{bmatrix}3 & 0 & 0 & :6\\ 0 & -3 & 0 & :-9\\ 0 & 0 & 1 & :4\end{bmatrix} \begin{matrix}x=2,\\ y=3,\\ z=4\end{matrix}$	1 Mark + 2 Marks 1 Mark + 1 Mark 1 Mark 2 Marks + 2 Marks	15 Minutes

Part C (2Q x 15M = 30Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
16	(i) Applying partial fraction to get A=2, B=-3 Evaluating individually to get answer as 2 Log(x-3)-3Log(x-5) (ii) Evaluating twice by integration by parts Simplification and Conclusion	4 Mark 4 Mark 4 Marks 3 Marks	25 Minutes
17	Characteristic equation $\begin{vmatrix} 1-\lambda & 1 & 3 \\ 1 & 5-\lambda & 1 \\ 3 & 1 & 1-\lambda \end{vmatrix} = 0$ Applying limits $\lambda^3 - 7\lambda^2 + 36 = 0$ Eigen values are $\lambda = -2, 3, 6$ System of equations are $\begin{aligned} (1-\lambda)x + y + z &= 0 \\ x + (5-\lambda)y + z &= 0 \\ 3x + y + (1-\lambda)z &= 0 \end{aligned}$ $\lambda_1 = 0 \quad X_1 = [1, 2, 2]^T$ $\lambda_1 = 3 \quad X_2 = [2, 1, -2]^T$ $\lambda_1 = 15 \quad X_3 = [2, -2, 1]^T$	1 Mark 3 Marks 1 Mark 1 Mark 3 Marks 3 Marks 3 Marks	25 Minutes