ROLL NO.	
ID NO.	

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 80 Max Time: 120 Mins Weightage: 40 %

ENDTERM FINAL EXAMINATION

I Semester AY 2017-18 Course: **MAT 101 ENGINEERING MATHEMATICS – I** 26 DECEM 2017

Instructions:

i. Write legibly.
ii. Scientific and non programmable calculators are permitted

---

Part A

[4 Q x 5 M= 20 Marks]

(**Note**: Answer ***ALL*** questions)

1. If $u(x,y)=\log\left(\frac{x^4-y^4}{x+y}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3.$

2. If $u=\frac{yz}{x}, v=\frac{zx}{y}, w=\frac{xy}{z}$, then show that $J\left(\frac{u,v,w}{x,y,z}\right)=4.$

3. Solve: $y(2x-y+1)\,dx+x(3x-4y+3)\,dy=0.$

4. Find the Directional derivative of $\phi=3x^2+2y-3z$ at (1,1,1) in the direction of $2\hat{i}+2\hat{j}-\hat{k}.$

Part B

[3 Q x 10 M= 30 Marks]

(**Note**: Answer any ***THREE*** questions)

5. Apply Gauss Jordan method to solve the following system of equations:

$$2x+5y+7z=52;\ 2x+y-z=0;\ x+y+z=9.$$

6. Find $div\,\vec{F}$ and $curl\,\vec{F}$ where $\vec{F}=\nabla(x^3+y^3+z^3-3xyz).$

7. Expand $e^x\log(1+y)$ in powers of x and y upto the second degree terms.

8. Find the orthogonal trajectory of the family of curves $\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1$, where λ is the parameter.

Part C

[2 Q x 15 M= 30 Marks]

(**Note**: Answer any ***TWO*** questions)

9. Find all the eigen values and the corresponding eigen vectors of the matrix A, where

$$A=\begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}.$$

10. Find the extreme values of the function $f(x,y)=x^3+3xy^2-15x^2-15y^2+72x.$

11. (a) Obtain the reduced formulae for $\int \sin^n x \ dx$ and $\int_0^{\frac{\pi}{2}} \sin^n x \ dx$.

(b) Evaluate $\int_0^1 x^{3/2}(1-x)^{3/2} \ dx.$

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 40 | Max Time: 60 Mins | Weightage: 20 %

TEST 2

I Semester AY 2017-2018 | Course: **MAT 101 Engineering Mathematics - I** | 23 OCT 2017

Instructions:

i. Write legibly
ii. Scientific and non-programmable calculators are permitted

---

Part A

(3Q x 4M = 12 Marks)

1. Prove with usual notations $\frac{1}{p^2} = \frac{1}{r^2} + \frac{1}{r^4}\left(\frac{dr}{d\theta}\right)^2$

2. Evaluate $\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^{\frac{1}{x^2}}$

3. Evaluate $\lim_{x\to 1}\left[\frac{x}{x-1} - \frac{1}{\log x}\right]$

Part B

(2Q x 8M = 16 Marks)

4. Find the constants *a*, *b*, *c* such that $\lim_{x\to 0}\frac{ae^x - b\cos x + ce^{-x}}{x\sin x}$ may be equal to 2.

5. Obtain Taylor's series expansion of $\log(\cos x)$ about the point $x = \frac{\pi}{3}$ up to the fourth degree term.

Part C

(1Q x 12M = 12 Marks)

6. Establish the pedal equation of the curve $r^n = a^n \sin n\theta + b^n \cos n\theta$ in the form $p^2\left(a^{2n} + b^{2n}\right) = r^{2n+2}$

(OR)

Obtain the Maclaurin's expansion of the function $\log(1+x)$ and hence deduce that

$$\log\sqrt{\frac{1+x}{1-x}} = x + \frac{x^3}{3} + \frac{x^5}{5} + \cdots.$$

PRESIDENCY UNIVERSITY, BENGALURU
SCHOOL OF ENGINEERING

Max Marks: 40 | Max Time: 60 Mins | Weightage: 20 %

TEST 1

I Semester 2017-2018 Course: **MAT 101 Engineering Mathematics - I** 22 SEPT 2017

Instructions:

i. Write legibly
ii. Scientific and non-programmable calculators are permitted

---

Part A

(3Q x 4M = 12 Marks)

1. If $y = \cos x \cos 2x \cos 3x$, find y_n.

2. Derive the nth derivative formula for the function $y = \log(ax+b)$.

3. Find the angle between radius vector and tangent of the polar curve $r^m = a^m(\cos m\theta + \sin m\theta)$

Part B

(2Q x 8M = 16 Marks)

4. Prove with usual notations that $\tan\phi = r\dfrac{d\theta}{dr}$.

5. Show that the following pairs of curves intersect each other orthogonally:

$r^n = a^n \cos n\theta \quad and \quad r^n = b^n \sin n\theta$

Part C

(1Q x 12M = 12 Marks)

6. If $y = a\cos(\log x) + b\sin(\log x)$, show that $x^2y_2 + xy_1 + y = 0$. Hence, apply Leibnitz's theorem to prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$