ROLL NO:	

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Weightage: 20 % Max Marks: 40 Max Time: 1 hr. Saturday, 22 September, 2018

TEST – 1 **SET A**

Odd Semester 2018-19 Course: **MAT 101 Engineering Mathematics I.** **I Sem (Common for all)**

Instruction:

(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

(3 Q x 4 M = 12 Marks)

1. If $y = \log\left(4x^2 - 1\right)$ then find y_n

2. Obtain the n^{th} derivative of $x^2 \sin 5x$

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

Part B

(2 Q x 8 M = 16 Marks)

4. If $y = \left(x^2 - 1\right)^n$ then prove that $\left(x^2 - 1\right)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$

5. Prove that the following curves intersect at the right angles $r = a\theta$ and $r = \dfrac{a}{\theta}$.

Part C

(1Q x 12 M = 12 Marks)

6. Find the pedal equation of the following curves $\dfrac{2a}{r} = (1 - \cos\theta)$.

OR

7. Expand $2x^3 + 7x^2 + x - 6$ in powers of $(x - 2)$.

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GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Weightage: 20 % Max Marks: 40 Max Time: 1 hr. Saturday, 22 September, 2018

TEST – 1 SET B

Odd Semester 2018-19 Course: **MAT 101 Engineering Mathematics - I** **I Sem (Common for all)**

Instruction:

(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

(3 Q x 4 M = 12 Marks)

1. If $y = \cos x \cos 2x \cos 3x$, find y_n.
2. Obtain the nth derivative for the function $y = x^2 \log 4x$.
3. Prove with usual notations that $\tan\phi = r\dfrac{d\theta}{dr}$.

Part B

(2 Q x 8 M = 16 Marks)

4. 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 $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0.$
5. Show that the following pair of curves intersects each other orthogonally:
$r^n = a^n \cos n\theta \quad and \quad r^n = b^n \sin n\theta$

Part C

(1Q x 12 M = 12 Marks)

6. Obtain the pedal equation of the polar curve $r^n = a^n \cos n\theta$

(OR)

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

ROLL NO:

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

SET A

TEST 2

Odd Semester: 2018-19

Course Code: MAT 101

Course Name: Engineering Mathematics-I

Branch & Sem: All(Physics & Chemistry Cycle) & I Sem

Date: 24 November 2018

Time: 1 Hour

Max Marks: 40

Weightage: 20%

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

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. a)The value of $\lim_{x \to 0} \frac{\sin x}{x}$ is

   (i) 0 (ii) 1 (iii) -1 (iv) ∞

   b) If $u = y^x$ then $\frac{\partial u}{\partial x} =$

   (i) $x^y \log x$ (ii) $x^y \log y$ (iii) $y^x \log x$ (iv) $y^x \log y$

   c) $u = 3x^2 + xy$ is a homogeneous function of degree

   (i) 0 (ii) 1 (iii) 2 (iv) 3

   d) If $div \vec{F} = 0$ then the vector function $\vec{F}$ is called

   (i) solenoidal (ii) conservative (iii) rotational (iv) irrotational

2. Evaluate $\lim_{x \to 0} \tan x \log x$

3. If $x = r\cos\theta, \quad y = r\sin\theta$ find the Jacobian of x, y with respect to r, θ

Part B

Answer **all** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. If $u = \tan^{-1}\left[\frac{x^3 + y^3}{x + y}\right]$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$. Hence show that

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \sin 4u - \sin 2u$$

5. Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1, -2, -1)$ in the direction of the

$2i - j - 2k$

Part C

Answer the Question. Question carries **twelve** marks. (1x12=12)

6. Show that $\vec{F} = (y+z)i + (z+x)j + (x+y)k$ is irrotational and find a scalar function

ϕ such that $\nabla\phi = \vec{F}$

OR

Find the extreme value of the function $f(x,y) = x^3y^2(1-x-y)$

ROLL NO:

PRESIDENCY UNIVERSITY, BENGALURU

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SET B

TEST 2

Odd Semester: 2018-19

Date: 24 November 2018

Course Code: MAT 101

Time: 1 Hour

Course Name: Engineering Mathematics-I

Max Marks: 40

Branch & Sem: All(Physics & Chemistry Cycle) & I Sem

Weightage: 20%

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

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. a) The value of $\lim\limits_{x\to 0} \dfrac{x}{\tan x}$ is

   (i) ∞ (ii) 0 (iii) 1 (iv) -1

   b) If $u = x^y$ then $\dfrac{\partial u}{\partial x} =$

   (i) yx^{y-1} (ii) xy^{x-1} (iii) $x^y \log x$ (iv) $x^y \log y$

   c) If $u = f(x,y)$ is a homogeneous function of degree n, then $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y}$ is

   (i) u (ii) $-nu$ (iii) nu (iv) 0

   d) If $\vec{A} = i + 2j + 2k,\ \vec{B} = 2i - j + 2k$ then $\vec{A} \square \vec{B}$ is

   (i) 1 (ii) 2 (iii) 3 (iv) 4

2. Evaluate $\lim\limits_{x\to 0} \dfrac{\log x}{\operatorname{cosec} x}$

3. If $u = x(1-y),\ v = xy$ find the Jacobian of u,v with respect to x, y

Part B

Answer **all** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. If $u = \sin^{-1}\left[\frac{x+y}{\sqrt{x}+\sqrt{y}}\right]$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$. Hence show that

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{-\sin u \cos 2u}{4\cos^3 u}$$

5. If $\vec{F} = \nabla\left(xy^3z^2\right)$ find $div\,\vec{F}$ and $curl\,\vec{F}$ at the point $(1,-1,1)$

Part C

Answer the Question. Question carries **twelve** marks. (1x12=12)

6. Find the constants a and b such that $\vec{F} = \left(axy + z^3\right)i + \left(3x^2 - z\right)j + \left(bxz^2 - y\right)k$ is irrotational and find a scalar function ϕ such that $\vec{F} = \nabla\phi$

OR

Find the maxima and minima for the function $f(x,y) = x^3 + xy^2 + 21x - 12x^2 - 2y^2$

Roll No. | | | | | | | | | | | |

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING — SET A

END TERM FINAL EXAMINATION

Odd Semester: 2018-19 — **Date**: 08 January 2019

Course Code: MAT 101 — **Time**: 2 Hours

Course Name: Engineering Mathematics I — **Max Marks**: 80

Programme & Sem: B.Tech (Common to all) & I Sem — **Weightage**: 40%

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

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20)

1. Evaluate: $\int_0^{\pi} x \sin^7 x \, dx$.

2. Solve: $(x^2 - ay)\, dx = (\mathrm{ax} - \mathrm{y}^2)\, dy$.

3. Solve: $\frac{dy}{dx} - \frac{2y}{x} = x + x^2$.

4. Find the rank of the matrix by reducing to Echelon form $\begin{bmatrix} 1 & 2 & -1 \\ 3 & 1 & 0 \\ 2 & -1 & 1 \end{bmatrix}$

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

5. Using reduction formula Evaluate: $\int_0^{\infty} \frac{x^4}{(1+x^2)^4}\, \mathrm{dx}$.

6. Solve: $x\frac{dy}{dx} + y = x^3 y^6$

7. Solve the following system of equations by Gauss Jordan method, $\begin{aligned} x+y+z&=9 \\ x-2y+3z&=8 \\ 2x+y-z&=3 \end{aligned}$

Part C

Answer **any two** the Questions. **Each** question carries **fifteen** marks. (2Qx15M=30)

8. Derive reduction formula for $\int \sin^n x \ dx$ and hence evaluate $\int_0^{\frac{\pi}{2}} \sin^n x \, dx$.

9. Find the Orthogonal Trajectories of the family of curves
$\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1, where \ \lambda$ is a parameter.

10. Find the Eigen values and Eigen vectors of a matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

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PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING — SET B

END TERM FINAL EXAMINATION

Odd Semester: 2018-19 — **Date**: 08 January 2019

Course Code: MAT 101 — **Time**: 2 Hours

Course Name: Engineering Mathematics I — **Max Marks**: 80

Programme & Sem: B.Tech (Common to all) & I Sem — **Weightage**: 40%

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

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20)

1. Evaluate $\int_0^{\pi} x \cos^4 x . \sin^5 x \, dx$
2. Solve: $(y\cos x + \sin y + y)\,dx + (\sin x + x\cos y + x)\,dy = 0.$
3. Solve: $\frac{dy}{dx} + y\cot x = 4x \operatorname{cosec} x.$
4. Find the rank of the matrix by reducing to Echelon form $\begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

5. Using reduction formula, evaluate: $\int_0^1 x^{3/2} (1-x)^{3/2} \, dx.$
6. Solve: $\tan y \frac{dy}{dx} + \tan x = \cos y.\cos^2 x$
7. Solve the following system of equations by Gauss Jordan method $\begin{aligned} x+2y+z&=3 \\ 2x+3y+3z&=10 \\ 3x-y+2z&=13 \end{aligned}$

Part C

Answer **any two** the Questions. **Each** question carries **fifteen** marks. (2Qx15M=30)

8. Derive reduction formula for $\int \cos^n x \, dx$ and hence evaluate $\int_0^{\frac{\pi}{2}} \cos^n x \, dx$.

9. Find the Orthogonal Trajectories of the family of curves
$\frac{x^2}{a^2}+\frac{y^2}{b^2+\lambda}=1, where\ \lambda$ is a parameter.

10. Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$