Roll No												

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

SUMMER TERM / MAKE-UP END TERM EXAMINATION

Semester: Summer Term 2019 **Date**: 22 July 2019

Course Code: MATH A 104 **Time**: 3 Hours

Course Name: Differential Equations and Fourier Series **Max Marks**: 100

Program & Sem: B.Tech & II Sem (2016 Batch) **Weightage**: 50%

Instruction

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

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

(iii) Scientific and Non-programmable calculators are permitted

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Part A

Answer **all** the questions. **Each** question carries **six** marks (5Qx6M=30M)

1. Obtain the Fourier series of $f(x) = 2x - x^2$ in $0 \le x \le 2$

2. Obtain the Fourier series of $f(x) = \begin{pmatrix} -k & in\ -\pi < x < 0 \\ k & in\ 0 < x < \pi \end{pmatrix}$

3. Form the PDE by eliminating the arbitrary constant $z = a\log(x^2 + y^2) + b$

4. Form the PDE by eliminating the arbitrary constant $z = e^{ax+by} f(ax - by)$

5. Solve $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$

Part B

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

6. Obtain the Fourier series of Obtain the Fourier series of $f(x) = \begin{pmatrix} -\pi & in\ -\pi < x < 0 \\ x & in\ 0 < x < \pi \end{pmatrix}$

Hence, deduce that $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$

7. Obtain the Cosine half range series for the function of $f(x) = (x-1)^2$ in $0 \le x \le 1$

8. Obtain the Complex form of Fourier series for the function $f(x) = e^x$ in $0 < x < \pi$

Part C

Answer **both** the questions. **Each** question carries **twenty** marks. (2Qx20M=40M)

9. Compute the constant term and the first two harmonics in the Fourier series

x	0	π/3	2π /3	π	4π /3	5π /3	2π
f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0

10. Solve: $\frac{\partial^3 u}{\partial x\, \partial t} = e^{-t}\cos x$ given that $u = 0$ *when* $t = 0$ and $\frac{\partial u}{\partial t} = 0$ at $x = 0$. Also show that $u \to \sin x$ as $t \to \infty$.

(or)

Solve: $\frac{\partial^2 u}{\partial x^2} + u = 0$, where u satisfies the conditions (i) $u\ (0, y) = e^{\frac{1}{2}}$ (ii) $\frac{\partial u}{\partial x}(0, y) = 1$