Roll No. ....

24022

B. Tech. 3rd Semester (CSE)

Examination – December, 2018

MATHEMATICS - III

Paper : Math-201-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, by selecting ***one*** Question from each Section. Question No. **1** is ***compulsory.***

1. ***Compulsory*** question :

(a) State Dirichlet's condition for existence of fourier series of a function.

(b) If $F_s(S)$ and $F_c(S)$ are fourier sine and cosine transform of $f(x)$ respectively, then show that :

(i) $F_s(xf(x)) = \frac{-d}{dx}\{F_c(s)\}$

(ii) $F_c(xf(x)) = \frac{d}{ds}\{F_s(s)\}$

(c) Show that :

$$f(z) = \frac{x^2 y^3 (x+iy)}{x^6 + y^{10}}, \ z \neq 0, \ f(0) = 0$$

is not analytic at origin.

(d) Evaluate :

$$\int_0^{1+i} (x^2 - iy)\, dz \text{ along the path } y = x^2$$

(e) Find the radius of convergence of the power series :

$$\sum \frac{2^{-n} z^n}{1 + in^2}$$

(f) A variate X has the probability distribution :

X :	–3	6	9
P[X = x] :	1/6	1/2	1/3

Find E $\left[(2x+1)^2\right]$.

(b) Using Dual simplex method, solve : 10

Min $z = x_1 + 2x_2 + 3x_3$

Subject to :

$2x_1 - x_2 + x_3 \geq 4, x_1 + x_2 + 2x_3 \leq 8, x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$.

(b) A certain screw making machine produces on average 2 defective screw out of 100, and packs them in boxes of 500. Find the probability that a box contains 15 defective screws. 10

SECTION – D

8. (a) 325 men out of 600 men chosen from a big city were found to be smokers. Does this information support the conclusion that the majority of men in the city are smokers. 10

(b) Two independent samples of size 7 and 9 have the following values: 10

Sample A :	10	12	10	13	14	11	10	–	–
Sample B	10	13	15	12	10	14	11	12	11

Test whether the difference between the mean is significant.

9. (a) Using Simplex method, solve : 10

Max $z = x_1 + x_2 + 3x_3$

Subject to $3x_1 + 2x_2 + x_3 \le 3, 2x_1 + x_2 + 2x_3 \le 2,$ $x_1, x_2, x_3 \ge 0$.

(g) Write a short note on :

(i) Test of significance

(ii) Errors

(h) Solve graphically Max $z = 3x + 4y$, subject to the constraints $2x + 4y \le 40;\ 2x + 5y \le 180, x \ge 0, y \ge 0$.

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SECTION – A

2. (a) Find the fourier series expansion of $f(x)$ if : 10

$$f(x) = \begin{cases} -\pi & , \quad -\pi < x < 0 \\ x & \quad 0 < x < \pi \end{cases}$$

and hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ... = \frac{\pi^2}{8}$.

(b) Develop $f(x)$ in a fourier series in the interval (0,2) if. : 10

$$f(x) = x, 0 < x < 1$$

$$= 0, 1 < x < 2$$

3. (a) Express $f(x)=\begin{cases}1 & , \quad 0\le x\le \pi \\ 0 & \quad x>\pi\end{cases}$ as a fourier sine integral and hence evaluate

$$\int_0^\infty \frac{1-\cos(\pi\lambda)}{\lambda}\sin(x\lambda)\,d\lambda .$$ 10

(b) Find the fourier cosine transform of e^{-x^2}. 10

SECTION – B

4. (a) Express Log (log i) in the form $A+iB$. 10

(b) If $\tan(\theta+i\phi)=\tan\alpha+i\sec\alpha$, show that : 10

$$e^{2\phi}=\pm\cot\alpha/2 \text{ and } 2\theta=\left(n+\frac{1}{2}\right)\pi+\alpha$$ 10

5. (a) If $w=\phi+i\psi$ represents the complex potential function for an electric field and $\psi=x^2-y^2+\frac{x}{x^2+y^2}$, determine ϕ. 10

(b) Evaluate $\oint_C \frac{e^{-2z}}{(z+1)^3}dz$, where C is the circle $|z|=2$ by using Cauchy's integral formula. 10

SECTION – C

6. (a) Expand $\frac{e^{2z}}{(z-1)^3}$ about the singularity $z=1$ in Laurent series. 10

(b) Evaluate the integral

$$\int_0^{2\pi}\frac{d\theta}{1-2r\sin\theta+r^2},\ (0<r<1).$$ 10

7. (a) A bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y. 10