Enroll. No. ______________

# SILVER OAK COLLEGE OF ENGINEERING & TECHNOLOGY

## ADITYA SILVER OAK INSTITUTE OF TECHNOLOGY

### BE - SEMESTER–I • MID SEMESTER-II EXAMINATION – WINTER 2018

### SUBJECT: Maths_1 (3110014) (ALL BRANCH)

DATE: 24-12-2018 TIME: 02:00 pm to 03:45 pm TOTAL MARKS:40

**Instructions:** 1.Q. 1 is compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if required.

**Q.1**

(a) Evaluate the improper integral $\int_0^\infty \frac{dx}{(1+x^2)(1+\tan^{-1}x)}$ [03]

(b) State the relationship between beta and gamma function. Also find $\Gamma(\frac{13}{2})$. [03]

(c) Find a Fourier series for $f(x) = x^2; -\pi \le x \le \pi$ [04]

**Q.2**

(a) (i) Test the convergence of series $\sum_{n=1}^{\infty} \frac{n}{e^{-n}}$ [06]

(ii) Test the convergence of series $\sum_{n=1}^{\infty} \frac{(n^3+1)}{2^n+2}$

(b) Find the Fourier series of $f(x) = 2x - x^2$ in the interval(0,3). [05]

(c) Evaluate the triple integral $\int_0^1 \int_0^x \int_0^{\sqrt{x+y}} z\, dz\, dy\, dx$ [04]

OR

**Q.2**

(a) (i) Test the convergence of series $\frac{1.2}{3^2.4^2} + \frac{3.4}{5^2.6^2} + \frac{5.6}{7^2.8^2} + \cdots$ [06]

(ii) Test the convergence of series $\sum_{n=1}^{\infty} \frac{2\tan^{-1} n}{1+n^2}$

(b) Find the Fourier cosine series of $f(x) = e^{-x}$ where $0 \le x \le \pi$ [05]

(c) Change the order of integration and then evaluate $\int_0^1 \int_x^1 sin\ (y^2)\, dy\, dx$ [04]

**Q.3**

(a) (i) Evaluate $\int_R\ xy\ dA$ over the area between $y = x^2$ and $y = x$ [06]

(ii) Prove that the sequence $\{a_n\};\ a_n = \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!}; n \in N$ is monotonic increasing and bounded. Is it convergent?

(b) Find the Taylor series expansion of $\tan\left(x + \frac{\pi}{4}\right)$ in powers of $x$ showing at least four non-zero terms. Hence find the value of $\tan 46°$. [05]

(c) Change the order of integration $\int_0^\infty \int_x^\infty e^{-y^2}\ dy\, dx$ and evaluate it. [04]

OR

Q.3 (a) Find radius of convergence and Interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(-3)^n (x^n)}{\sqrt{n+1}}$ [06]

(b) Evaluate the integral $\int_0^1 \int_0^{1-x} e^{\frac{y}{(x+y)}}\ dy\, dx$ by changing the variable $x + y = u$, [05]

$y = uv$

(c) Express $(x-1)^4 - 3(x-1)^3 + 4(x-1)^2 + 5$ in ascending powers of $x$ [04]