GIT

Roll No. ______________

# GLOBAL INSTITUTE OF TECHNOLOGY

**B. Tech. I Semester First Midterm Exam 2022**

**1FY2-01/ Engineering Mathematics-I**

**Common for All Sections**

**26-12-2022/ Monday**

**Time: 3 Hours** **Maximum Marks: 70**

**Attempt all questions**

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. **No supplementary sheet shall be issued in any case.**

## Part A (Answer should be given up to 25 words only)

**All questions are compulsory**

Q.1 Define Beta & Gamma Function (CO2)

Q.2 Evaluate the value of $\Gamma\left(-\frac{3}{2}\right)$ (CO1)

Q.3 Prove that $\Gamma(n+1) = n\,\Gamma(n)$ (CO2)

Q.4 Prove that $B(m,n) = B(m+1,n) + B(m,n+1)$(CO3)

Q.5 What is Even and Odd Function, Give two example of Odd & Even Function(CO1)

Q.6 Find the half range sine series for the function $f(x) = x; 0 < x < 2$ (CO2)

Q.7 State Parseval's theorem (CO1)

Q.8 What is the value of $\Gamma\left(\frac{1}{2}\right)$ (CO1)

Q.9 What is Periodic function, Give an example of periodic function. (CO3)

Q.10 Write the Duplication Forumla (CO2)

**10x 2 = 20**

## Part B Analytical/Problem solving questions

**Attempt all questions (word Limit 100)**

Q.1 Find the volume of the solid generated by revolution of the curve $(a-x)y^2 = a^2x$, about its asymptotes. (CO1)

Q.2 Find the surface generated by revolving the tractrix $x = a\cos t + \frac{a}{2}\log \tan^2\frac{t}{2}, y = a\sin t$ about its asymptotes. (CO1)

Q.3. Evaluate $\int_0^a x^3(2ax - x^2)^{3/2}dx$ (CO2)

$\frac{\Gamma m\,\Gamma n}{\Gamma m+n} = \beta(m,n)$

Q.4. Drive the relation between Beta and Gamma Function (CO3)

$\int_0^1 x^{m-1}(1-x)^{n-1}$

$\Gamma m \cdot \int_0^\infty e^{-x}(1-x)^{m-1}dx$

Q.5 Find the half range cosine series for the function $f(x) = \begin{cases} kx, & 0 \le x \le \frac{l}{2} \\ k(l-x) & \frac{l}{2} < x \le l \end{cases}$ (CO2)

**5 x 4 =20**

## Part C(Descriptive/Analytical/Problem Solving/Design Question)

**Attempt all questions**

Q.1 Prove that the surface area of the solid generated by revolution of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, about the major axis is $2\pi ab\left[\sqrt{1-e^2} + \frac{1}{e}(\sin^{-1}e)\right]$, where $b^2 = (1-e^2)$. (CO1)

Q.2 Show that $\Gamma(m)\Gamma\left(m+\frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m); m \in z$ or $\int_0^\infty e^{-ax}\sin bx\, x^{m-1} = \frac{\Gamma m \sin m\theta}{(a^2+b^2)^{m/2}}$ (CO2)

Q.3 Find the Fourier series for the function $f(x) = x + x^2;\ -\pi < x < \pi$. Hence Show that

(i) $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \cdots$ (ii) $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \cdots$ (CO3) **3x 10 =30**

$a_n = \frac{2}{n^2}\left((-1)^n - 2\pi(-1)^n\right)$

b

$+2\pi$

$2a \times 2a\sin\theta - (1-\sin\theta)^3$

2.25

$\Gamma n\,\Gamma 1-n$ $\frac{\pi}{\sin}$

ILATE

$e^{2x}$

$(4a\sin\theta)^h$

$(2a\sin\theta)^3$

ILATE