

1E3101

Roll No. _____

Total No. of Pages: **2****1E3101****B. Tech. I - Sem. (Main/Back/Re-back) Exam., Jan.-2026****1FY2-01 Engineering Mathematics - I****Time: 3 Hours****Maximum Marks: 70***Instructions to Candidates:**Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.**Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.**Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*1. NIL2. NIL**PART – A****[10×2=20]****(Answer should be given up to 25 words only)****All questions are compulsory**

Q.1 Write the relation between Beta and Gamma function.

Q.2 Find the volume of solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the x-axis.Q.3 Test the series $1 - \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} - \frac{1}{4\sqrt{4}} + \dots$

Q.4 Define the power series.

Q.5 Define the periodic function.

Q.6 State the Parseval's theorem.

Q.7 Evaluate $\lim_{(x,y) \rightarrow (1,2)} \frac{x^2+7y}{x+y^2}$ Q.8 Evaluate curl \vec{q} ; where -

$$\vec{q} = (y+z)\mathbf{i} + (z+x)\mathbf{j} + (x+y)\mathbf{k}$$

Q.9 Evaluate $\int_0^3 \int_1^2 xy(1+x+y) dx dy$.

Q.10 State Gauss's divergence theorem.

[1E3101] / 453

Page 1 of 2

[11260]

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

- Q.1 Evaluate $\int_0^{\frac{\pi}{6}} \cos^4 3\theta \sin^2 6\theta \, d\theta$.
- Q.2 Test the series –
- $$\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \frac{x^4}{4.5} + \dots$$
- Q.3 Find half range cosine series for the function $f(x) = 2x - 1$.
- Q.4 Find the directional derivative of $(x^2 + y^2 + 4xyz)$ at $(1, -2, 2)$ in the direction of $2i - 2j + k$.
- Q.5 Find the maximum or minimum value of the function $u = xy + \frac{a^3}{x} + \frac{a^3}{y}$.
- Q.6 Evaluate the following integral by changing its order $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} \, dx \, dy$.
- Q.7 Evaluate $\int_c \vec{F} \cdot d\vec{r}$, where $\vec{F} = x^2y^2i + yj$ and c is the curve $y^2 = 4x$ in the xy plane from $(0, 0)$ to $(4, 4)$.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

- Q.1 Find the surface area of the solid generated by the revolution of the asteroid $x = a\cos^3 t, y = a\sin^3 t$ about the x -axis.
- Q.2 Expand $\sin x$ in powers of $(x - \frac{\pi}{2})$.
- Q.3 Find the Fourier series to represent $f(x) = x - x^2$ in the interval $-1 < x < 1$
- Q.4 By using the method of Lagrange's multipliers, find the maximum or minimum value of $u = x^2 + y^2 + z^2$, when $ax^2 + by^2 + cz^2 = 1$ and $lx + my + nz = 0$
- Q.5 Verify Green's theorem for the integration -
 $\int_c [(x^2 - xy^3)dx + (y^2 - 2xy)dy]$, where c is the square with vertices $(0, 0)$ $(2, 0)$, $(2, 2)$ and $(0, 2)$.
-