1E3101

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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. NIL 2. 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 $1-\frac{1}{2\sqrt{2}}+\frac{1}{3\sqrt{3}}-\frac{1}{4\sqrt{4}}+\ldots\ldots\ldots$

Q.4 Define the power series.

Q.5 Define the periodic function.

Q.6 State the Parseval's theorem.

Q.7 Evaluate $\lim_{(x,y)\to(1,2)} \frac{x^2+7y}{x+y^2}$

Q.8 Evaluate curl $\vec{q}$; where -

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

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

Q.10 State Gauss's divergence theorem.

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 –

$$\frac{x}{1.2} + \frac{x^2}{2.3} + \frac{x^3}{3.4} + \frac{x^4}{4.5} + \ldots\ldots\ldots$$

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 $\int_c \vec{F} . d\vec{r}$, 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 sinx in powers of $\left(x-\frac{\pi}{2}\right)$.

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).
