

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY
Back-log Examination, 7 March 2022
Calculus and applied mechanics
B. Tech., Semester I

Course Code : ES1103

Roll No.....

Time: 3 hours

Max. Marks: 40

Instructions to students:

Do not write anything other than your roll number on question paper.

Assume suitable data wherever required and mention it clearly.

Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1 Find the work done by $\mathbf{F}$ over the curve in the direction of increasing t : 5

$\mathbf{F} = xy \mathbf{i} + y \mathbf{j} - yz \mathbf{k}$, $\mathbf{r}(t) = t \mathbf{i} + t^2 \mathbf{j} + t \mathbf{k}$, $0 \leq t \leq b$ where b is parameter (your roll number)

Ans:(a) $\frac{1}{2}b^4$

(b) b^4

Q.2 5

(c) $2b^4$

(d) $3b^4$

Evaluate the line integral $\int_C (xy + y + z) ds$

Along the curve $\mathbf{r}(t) = 2t \mathbf{i} + t \mathbf{j} + (2 - 2t) \mathbf{k}$, $0 \leq t \leq b$ where b is parameter (your roll number)

Q3. 5

Ans:(a) $3 \left[\frac{2}{3}b^3 - \frac{b^2}{2} + 2b \right]$

(b) $b^3 - b^2$

(c) $b^3 - 3b$

(d) $b^4 - 4b^2 + 3b$

Use Green's Theorem to find the outward flux for the field $\mathbf{F}$ and curve C . $\mathbf{F} = (x-y) \mathbf{i} + (y-x) \mathbf{j}$

C : the square bounded by $x=0$, $x=a$, $y=0$, $y=b$

Ans: (a) $2ab$

(b) $3ab$

(c) 4ab

(d) 5ab

- Q.4 It is required to build a parabolic satellite dish, whose shape will be formed by rotating a parabolic curve $y=ax^2$ about the y-axis. If the dish is to be have a diameter of d m and a depth of h m, find the volume of the dish. **10**

Here d and h are the parameters.

- Q.5 Find all extremas of function $f=[x^3 + 3*x*y*y - 15*x*x - a*y^2 + b*x]$. Also find the minimum and the maximum value of this function. **10**

Here a and b are the parameters.

- Q.6 Find the value of K so that $\int_1^2 \int_0^3 kx^2 y dx dy = 1$ **5**
(a) 3/27
(b) 2/27
(c) 2/29
(d) 3/31