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**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, DECEMBER 2008**

**EN 04 301 B—ENGINEERING MATHEMATICS—III**

(For CS and IT)

[2004 Admissions]

Time : Three Hours

Maximum : 100 Marks

*Answer all questions.*

1. (a) If  $V = \mathbb{R}^3$ , show that  $W = \{(a, b, 0) \mid a, b \in \mathbb{R}\}$  is a subspace of  $V$ .
- (b) Show that the vectors  $(1, -2, 1), (2, 1, -1), (7, -4, 1)$  in  $\mathbb{R}^3$  are linearly dependent.
- (c) If  $F(f(t)) = F(w)$  and  $t_0$  is any real number, then show that :

$$F(f(t - t_0)) = F(w) e^{-i\omega t_0}.$$

- (d) Find the Fourier cosine transform of  $f(t)$  where :

$$f(t) = \begin{cases} 1 & 0 \leq t \leq l \\ 0 & t > l \end{cases}$$

- (e) Find the general and principle values of  $(1 + \sqrt{3}i)^{1+i}$ .
- (f) Show that if  $f(z)$  is analytic and  $\operatorname{Re} f(z) = a$  constant, then  $f(z)$  is a constant.
- (g) Prove that  $\int_C (z - a)^n dz = \begin{cases} 0, & \text{if } n \text{ is any integer } \neq -1 \\ 2\pi i, & \text{if } n = -1 \end{cases}$
- (h) Evaluate  $\int_C \frac{e^{2z}}{(z+1)^4} dz$  where  $C$  is the circle  $|z| = 2$ .

(8 × 5 = 40 marks)

2. (a) (i) Show that the mapping  $F : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  defined by  $F(x, y) = (x + y, x)$  is linear. (7 marks)
- (ii) Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}$  be a linear mapping for which  $T(1, 1) = 3$  and  $T(0, 1) = -2$ . Find  $T(a, b)$ .

(8 marks)

Or

Turn over