



Questions for the Periodical Examination

Subject: Engineering Mathematical (2)

800202-4

Total Marks : 30	No. of Questions : 4	No. of Pages : 2
Assume Any Missing Data in a Logical Manner		

Answer the Following Questions:-

Question [1]

(7.5 Marks)

a) For the vectors  $a = 2i + j + 4k$ ,  $b = -4i + 3k$ ,  $c = 3i - 2j + k$ ,

Find The product,  $(c \times b) \cdot (a \times b)$ .

b) Find the volume of the Tetrahedron with vertices  $(1,1,1), (4,7,2), (3,2,1), (5,4,3)$ .

c) Let  $a = i + j + k$ ,  $b = 2i + 3j + k$ ,  $c = -i + j + 0k$

Find the angle between  $(a + b)$ ,  $c$

Question [2]

(7.5 Marks)

a) Find

(i) The divergence ( $\text{div } f$ ), and

(ii) Curl ( $\text{Curl } f$ )

of the vector  $f(x, y, z)$  given with respect to right-handed Cartesian coordinates.

$$f(x, y, z) = \sin y i + \cos z j - \tan x k$$

b) Find the work done by a force ( $p$ ) acting on a body if the body is displaced from point A to a point B along the straight segment  $\overline{AB}$ .

$$p = 5i - 2j + k, \quad A:(4, 0, 3), \quad B:(6, 0, 8)$$

Question [3]

(7.5 Marks)

Let

$$f(x, y, z) = z y + y x,$$

$$v(x, y, z) = y i + z j + (4z - x) k, \text{ and}$$

$$w(x, y, z) = y^2 i + z^2 j + x^2 k$$

Find

- grad  $f$  at point  $(3, 4, 0)$ .
  - Curl ( grad  $f$  ).
  - div (  $v \times w$  ) at point  $(1, 1, 1)$ .
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Question [4]

(7.5 Marks)

a) Using the Gamma function  $\Gamma(n) = \int_0^{\infty} t^{n-1} e^{-t} dt$ , , show that  $\Gamma(2) = 1$ .

b) Using the value  $\Gamma(\frac{1}{2}) = \sqrt{\pi}$  find  $\Gamma(4.5)$  and  $\Gamma(-\frac{11}{2})$ .

c) Prove that  $\int_0^{\infty} 3^{-4z^2} dz = \frac{1}{4} \sqrt{\frac{\pi}{\ln 3}}$

d) Prove that  $\int_0^1 \sqrt{\ln\left(\frac{1}{x}\right)} dx = \frac{\sqrt{\pi}}{2}$

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*Good Luck for all*  
*Prof. Dr. Sayed H. A. El-Banna*