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Ex/EE/MATH/T/215/2017(OLD)(S)

B.E.Electrical. Examination, 2017

(2nd YR, 1st SEM., SUPPLY (OLD))

MATHEMATICS

PAPER - IV F (OLD)

Full Marks : 100 **Time: Three hours**

Part - I

Answer any five questions. $10 \times 5 = 50$

1. Show that the necessary and sufficient condition for a vector function $\overrightarrow{F}(t)$ to have constant direction is

$$\overrightarrow{F}(t) \times \frac{d\overrightarrow{F}(t)}{dt} = 0$$

2. Find the angle between two surfaces

$$x^2 + y^2 + z^2 = 9 \;\; and \;\; z = x^2 + y^2 - 3 \;\; at \; (2, -1, 2).$$

3. Prove that:

$$(i) \; curl \; grad \; \phi = 0 \;\; (ii) \; div \; curl \; \overrightarrow{F} = 0$$

4. State Stoke's theorem. Verify Stoke's theorem where

$$\overrightarrow{F} = y\overrightarrow{i} + (x - 2xz)\overrightarrow{j} - xy\overrightarrow{k}.$$

and the surface S is the part of the sphere

$$x^2 + y^2 + z^2 = a^2$$

above xy plane.

5. Define analytic function. Find the values of constants a, b, c, d such that the function

$$f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$$

is analytic.

6. (a). Find the value of the

$$\oint_c \frac{dz}{1+z^2},$$

where c is the contour

$$\left|z - \frac{i}{2}\right| = 1.$$

(b). Obtain the Taylor series which represents the function

$$\frac{z^2-1}{(z+2)(z+3)},$$

in the regions $|z| < 2$.

7. Find the analytic function $f(z) = u + iv$ of which the real part

$$u = e^x(x\cos y - y\sin x).$$

8. (a) Define with examples of regular point, singular point, isolated singularity and removal singularity.
(b) Show that the function

$$f(z) = |xy|^{\frac{1}{2}}$$

satisfies Cauchy-Riemann equations at the origin but $f'(0)$ does not exist.

PART II

Answer ALL Questions. Each question carries 10 marks.

1. Two coins are tossed. Find the probability of getting Heads on each of them.

2. Three Dice are rolled. Find the probability of getting a sum of 4.

3. A Committee of Five is to be selected from 5 Men and 4 Women. If selection is made at random, find the probability that the Committee contains 3 Men and 2 Women.

4. State and Prove Bayes Theorem of Conditional Probabilities.

5. Find the mean of a Poisson Random Variable with parameter μ.