Ex./EE/MATH/T/215/2018(OLD) (S)

BACHELOR OF ENGINEERING ELECTRICAL EXAMINATION, 2018

(2nd Year, 1st Semmester, Supplementary, Old Syllabus)

Mathematics - IV F (OLD)

Time : Three hours

Full Marks : 100

Use separate Answer Scripts for each part.

PART - I (50 marks)

Answer any *five* questions.

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

$$\vec{F}(t) \cdot \frac{d\vec{F}(t)}{dt} = 0$$

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:

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

4. What do you mean by solenoidal and irrotational vector field. If $\vec{A}$ and $\vec{B}$ are irrotational , then prove that $\vec{A} \times \vec{B}$ are solenoidal.

5. If a function

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

has a derivative at the point $z_0 = (a, b)$, then show that at that point

$$f' = u_x + iv_x = v_y - iu_y$$

and also

$$u_x = v_y \; and \; v_x = -u_y$$

6. 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.

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

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

8. Define with examples of regular point, singular point, isolated singularity and removal singularity.
Evaluate

$$\int_0^\infty \frac{x^2 dx}{x^4 + 16}$$

PART - II (50 marks)

Attempt any *five* questions. Each question carries 10 (ten) marks

9. Define classical probability. If a fair coin is tossed four times, find the probability of no Head.

10. A dice is rolled twice. Find the probability that

    (i) The sum of the upturned faces is Nine.

    (ii) Double Six does not appear

11. Define conditional probability. State and prove Bayes' formula on conditional probability.

12. A team of four players is to be formed out of three male and four female players. Find the probability that the team selected consists of two male and two female players.

13. Find the mean and variance of a Poisson distribution.

14. A random variable takes on values 0, 1 and 2 with probabilities $^1/_4$, $^1/_4$ and $^1/_2$ respectively. Find its mean and variance.

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