

Calculate the coefficient of correlation between the marks in Mathematics and Physics for 8 students:

Mathematics :	76	90	98	69	54	82	67	52
Physics :	25	37	56	12	17	36	27	11

5. a) Write the mean and variance of the Binomial distribution.
 b) Define types of sampling.
 c) A manufacturer who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain no defectives. (Given $e^{-0.5} = 0.6065$)
 d) A random sample of size 16 has 53 as mean. The sum of the squares of the deviations take from mean is 150. Can this sample be regarded as taken from the population having 56 as mean? Obtain 95% and 99% confidence limits of the mean of the population. [For $\nu = 15$, $t_{0.01} = 2.95$ and $t_{0.05} = 2.13$]

OR

The probability that an evening college student will graduate is 0.4. Determine the probability that out of 5 students.

- (i) None (ii) one and (iii) atleast one will graduate.

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BE-401

B.E. IV Semester

Examination, December 2015

Mathematics - III

(Common for all Branches)

Time : Three Hours

Maximum Marks :70

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
 ii) All parts of each questions are to be attempted at one place.
 iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
 iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Write Cauchy-Riemann equations in polar form.

b) If $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ then find $\text{Res } f(1)$.

c) Find the value of $\int_C \frac{z^2 + 3z + 1}{z-1} dz$ where C being $|z| = \frac{1}{2}$

- d) Apply calculus of Residue to prove that

$$\int_0^{2\pi} \frac{\cos 2\theta}{1 - 2a \cos \theta + a^2} d\theta = \frac{2\pi a^2}{1 - a^2}, (a^2 < 1).$$

OR

[2]

Show that $e^x (x \cos y - y \sin y)$ is a harmonic function. Find the analytic function for which $e^x (x \cos y - y \sin y)$ is imaginary part.

2. a) Write a short note on errors.
 b) Write the procedure of Gauss-elimination method for solving the system of simultaneous linear equations.
 c) Find a real root of the equation $f(x) = x^3 - 4x - 9 = 0$, using bisection method in four stages.
 d) Find a real root of the equation $x^4 - x - 13 = 0$ by Newton Raphson method correct to three decimal places.

OR

Solve the following system by Gauss-Seidel method:

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$2x + 3y + 10z = 22$$

3. a) Find the value of $\left(\frac{\Delta^2}{E}\right)e^x$.

- b) Prepare the difference table for the following data:

$$x : 10 \quad 20 \quad 30 \quad 40 \quad 50$$

$$y : 12 \quad 15 \quad 20 \quad 27 \quad 39$$

- c) Evaluate $\int_0^1 \frac{dx}{1+x}$ by using Simpson's $\frac{1}{3}$ rule, take $n = 5$.

[3]

- d) Find a polynomial satisfied by $(-4, 1245)$, $(-1, 33)$, $(0, 5)$, $(2, 9)$ and $(5, 1335)$ by Newton's divided difference formula.

OR

Calculate the first and second derivatives of the function tabulated below, at the point $x = 1.1$.

$x :$	1.0	1.2	1.4	1.6	1.8	2.0
$f(x) :$	0	0.128	0.544	1.296	2.432	4.0

4. a) If $\frac{dy}{dx} = f(x, y)$ with initial condition $y = y_0$ at $x = x_0$, then write first two approximations using Picard's method.
 b) Write the normal equations for equation of second degree parabola to be fitted to given set of data.
 c) Use Euler's method to find $y(0.2)$ from the differential equation $\frac{dy}{dx} = xy$, $y(0) = 1$ take $h = 0.1$
 d) Use Runge-kutta method to solve the equation $\frac{dy}{dx} = 1 + y^2$ for $x = 0.2$ to $x = 0.4$ with $h = 0.2$, given that $y(0) = 0.5$.

OR