JHARKHAND Rai University
RANCHI

End Semester /Reappear (Semester II) Examination May 2025

Programme: Diploma (CSE & MiE) **Full Marks: 70**
Course: Basic Mathematics **Time: 3 Hrs.**
Course Code: 9D.154
Enrolment no. _____

Section I

1. **Short Answer type questions. Answer any four.** **4 x 5 = 20**
   a. Two cards are drawn at random from a well – shuffled pack of 52 cards. What is the probability that both the drawn cards are aces?
   b. Find real values of x and y for which (1 – i)x + (1 + i)y = 1 – 3i
   c. If A $= \begin{bmatrix} 3 & 4 \\ -2 & 0 \\ 7 & -5 \end{bmatrix}$ $and\ B = \begin{bmatrix} 2 & -3 \\ 5 & 6 \\ -1 & 8 \end{bmatrix}$. Verify that $(A+B)^T = A^T + B^T$
   d. If a line makes angle $\alpha, \beta,\ and\ \gamma$ with the coordinate axes, prove that $Sin^2\alpha + Sin^2\beta + Sin^2\gamma = 2$.
   e. Express $(-1+3i)^{-1}$ in standard form.
   f. Find a matrix X, if X + $\begin{bmatrix} 5 & 6 \\ -4 & 7 \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ 7 & -8 \end{bmatrix}$

Section II

Long Answer type questions. Answer any three. **3 x 10 = 30**

2. A can solve 90% of the problems given in a book, and B can solve 70%. What is the probability that at least one of them will solve a problem selected at random from the book?
3. Separate $\frac{3+i}{2-i}$ into real and imaginary parts and hence find its modulus.
4. If $A = \begin{bmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{bmatrix}\ and\ B = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$ then find AB and BA.
5. Find the equations of a line which passes through the point (-1,3,-2) and perpendicular to each of the lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}\ and\ \frac{x+2}{-3} = \frac{y-1}{2} = \frac{z+1}{5}$.
6. Find mean deviation about mean of given frequency distribution

Marks obtained:	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of students:	8	6	12	5	3	7

Section III

Application based questions. Answer any one. **1 x 20 = 20**

7. a. If Z is a complex number such that |z|=1, prove that $\left(\frac{z-1}{z+1}\right)\ where\ z \neq -1$,is purely imaginary except when z=1.
   b. Evaluate $\sqrt{-5+12i}$
8. Verify that for A = $\begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, A (Adj A)= |A| I.
9. Find the length and the equation of the line of shortest distance between the lines given by

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}\ and\ \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}.$$

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