

**GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI**  
**(An Autonomous Institute of Government of Maharashtra)**

CT-I Engineering Mathematics-IV SHU401 [EXTC/ELPO]

Date: 23/01/2017

Time: 1hr

Max. Marks 15

Q.1 Show that when  $|z + 1| < 1$ ,  $z^{-2} = 1 + \sum_{n=1}^{\infty} (n+1)(z+1)^n$ . (03)

Q.2 Attempt any three:- (12)

e) State Cauchy integral formula and hence evaluate  $\oint_c \frac{3z^2 + z}{z^2 - 1} dz$ , where c is the circle

$|z - 1| = 1$ .

f) Evaluate:  $\int_0^{1+i} (x - y + ix^2) dz$  along

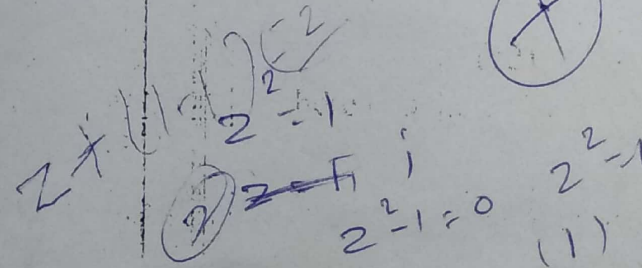
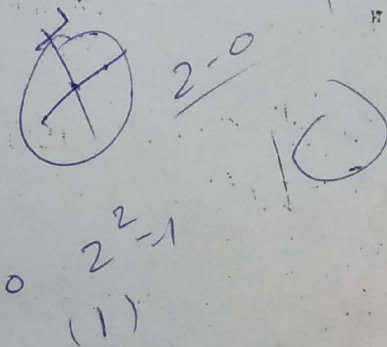
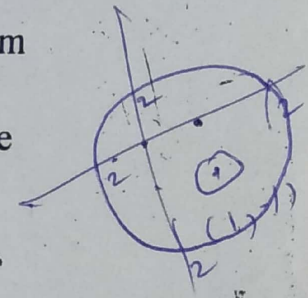
i) the straight line from  $z = 0$  to  $z = 1 + i$

iii) the real axis from  $z = 0$  to  $z = 1$  and then along a line parallel to imaginary axis from  $z = 1$  to  $z = 1 + i$

g) State Cauchy residue theorem and hence evaluate  $\oint_c \frac{z-3}{z^2 + 2z + 5} dz$ , where c is the circle

ii)  $|z| = 1$  ii)  $|z + 1 - i| = 2$

h) Evaluate the following integrals by contour integration  $\int_0^{2\pi} \frac{d\theta}{5 - 3 \cos \theta}$ .



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(An Autonomous Institute of Govt. of Maharashtra)

CT-1 Summer-2019

SHU401 ENGG. MATHS-IV (EE/ET/IN)

Marks: 15

Time: 1 hour

Date: 17/01/2019

Q.1) Let  $V = \mathbb{R}^+$  be the set of all positive reals. Define addition of any two numbers  $\bar{x}$  and  $\bar{y}$  as the usual multiplication of numbers, that is  $\bar{x} + \bar{y} = x \cdot y$ . Define scalar multiplication by a scalar  $k$  on any  $\bar{x} \in \mathbb{R}^+$  to be  $x^k$ , that is,  $k\bar{x} = x^k$ . Then show that  $V$  is a vector space. (03)

Q.2) Attempt any four: (12)

a) Evaluate:  $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$  where  $C$  is the circle  $|z| = 3$ .

b) Expand  $\frac{1}{z^2 - 4z + 3}$  in the region i)  $|z| < 1$  ii)  $1 < |z| < 3$  iii)  $0 < |z-1| < 2$ .

c) Evaluate  $\int_0^{1+i} (x^2 - iy) dz$  along the paths (a)  $y = x$  (b)  $y = x^2$ .

d) Evaluate  $\int_0^\pi \frac{d\theta}{3 + 2 \cos \theta}$  using contour integral in complex plane.

e) Using residue theorem evaluate  $\oint_C \frac{(2z-1)}{z(z+1)(z-3)} dz$  where  $C: |z| = 2$ .