

Name: Admission No:

ABES Institute of Technology, Ghaziabad

Subject Code: BAS103

Subject Name: Engineering Mathematics-I

Year - 1st, Branch-All

2nd ASSIGNMENT (ODD SEMESTER 2024-25)

[Time: 1 Hours]

[Total Marks: 10]

COURSE OUTCOMES

CO	Statements
3	<i>Applying</i> the concept of partial differentiation to <i>evaluate</i> extrema, series expansion, error approximation of functions and Jacobians.

(SET-A)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	<i>Obtain</i> the series of $f(x) = \tan^{-1}x$ in powers of x up to three terms.	3
b.	<i>Find</i> the extreme value of the function $z = x^2 + 2y^2 - 12x + 24$.	3

SECTION-B

Q.2	Attempt two Questions. (2x3=6)	CO
a.	If $u^3 + v + w = x + y^2 + z^2$, $u + v^3 + w = x^2 + y + z^2$, $u + v + w^3 = x^2 + y^2 + z$ then <i>show</i> that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{1-4xy(xy+yz+zx)+16xyz}{2-3(u^2+v^2+w^2)+27u^2v^2w^2}$.	3
b.	<i>Prove</i> that the functions $u = x + 2y + z, v = x - 2y + 3z, w = 2xy - zx + 4yz - 2z^2$ are functionally dependent. Also <i>find</i> relation between them.	3
c.	The pressure P at any point (x, y, z) in space is $P = 400xyz^2$. <i>Find</i> the highest pressure at the surface of a unit sphere $x^2 + y^2 + z^2 = 1$.	3

SECTION-C

Q.3	Attempt one Questions. (1x3=3)	CO
a.	<i>Express</i> the function $f(x, y) = x^y$ as Taylor's series expansion about the (1, 1) up to third degree term.	3
b.	<i>Expand</i> $e^x \log(1+y)$ in powers of x and y up to third degree terms.	3

(SET-B)

SECTION-A

Q.1	Attempt one Questions. (1×1=1)	CO
a.	<i>Obtain</i> the series of $f(x) = \tan^{-1} \frac{2x}{1-x^2}$ in powers of x up to three terms.	3
b.	<i>Find</i> the extreme value of $z = x^2 + y^2 + 6x + 12$.	3

SECTION-B

Q.2	Attempt two Questions. (2x3=6)	CO
a.	If $u^3 + v^3 + w^3 = x + y + z$ $u^2 + v^2 + w^2 = x^3 + y^3 + z^3$ $u + v + w = x^2 + y^2 + z^2$ then <i>show</i> that $\frac{\partial(u, v, w)}{\partial(x, y, z)} = \frac{(x-y)(y-z)(z-x)}{(u-v)(v-w)(w-u)}$.	3
b.	<i>Prove</i> that the functions $u = xy + yz + zx, v = x^2 + y^2 + z^2, w = x + y + z$ are functionally dependent. Also <i>find</i> relation between them.	3
c.	A scope probe in the shape of ellipsoid $4x^2 + y^2 + 4z^2 = 16$ enters the earth atmosphere and its surface begins to heat. After one hour the temperature at the point (x, y, z) on the surface is $T(x, y, z) = 8x^2 + 4yz - 16z + 600$. <i>Find</i> the hottest point on the probe surface.	3

SECTION-C

Q.3	Attempt one Questions. (1x3=3)	CO
a.	<i>Express</i> the function $f(x, y) = y^x$ as Taylor's series expansion in powers of (x - 1) and (y - 1) up to third degree term.	3
b.	<i>Expand</i> $e^y \log(1+x)$ in powers of x and y up to third degree terms.	3