ABES Engineering College, Ghaziabad

Department of Applied Sciences & Humanities

Session: 2023-24 **Semester: I** **Section: All**

Course Code: BAS-103 **Course Name: Engineering Mathematics-I**

Assignment 3

Date of Assignment: **Date of submission:**

S.No.	KL	CO	PI	Question	Marks
1	K3	CO3	1.2.1, 1.3.1, 2.1.3, 2.4.1, 2.4.2	Expand x^y in powers of (x – 1) and (y -1) up to third degree terms and hence evaluate $(1.1)^{1.02}$.	5
2	K3	CO3	1.2.1, 1.3.1, 2.1.3, 2.4.1, 2.4.2	Find the values of a and b such that the expansion of log(1+x) – [x(1+ax) / (1+bx)] in ascending powers of x begins with the term x^4 and hence find this term.	5
3	K3	CO3	1.3.1, 2.2.3, 2.4.2	If u = x + y + z, v = $x^2 + y^2 + z^2$, w = $x^3 + y^3 + z^3$ - 3xyz, prove that u, v, w are functionally related and find the relation between them.	5
4	K3	CO3	2.2.4, 2.2.5, 2.3.2, 2.4.1, 2.4.2, 2.4.3, 3.1.1,	Discuss the maximum or minimum values of the function: $f(x, y) = xy(a - x - y)$	5
5	K3	CO3	2.2.5, 2.3.2, 2.4.2, 2.4.3, 3.3.2,	In estimating the cost of a pile of bricks measured as $6m \times 50m \times 4m$, the tape is stretched 1% beyond the standard length. If the count is 12 bricks in $1m^3$and bricks cost 100 per 1,000, find the approximate error in the cost.	5

6.	K3	CO3	5.1.1, 10.1.2, 10.3.1	Show that the rectangular solid of maximum volume that can be inscribed in a given sphere is a cube.	5
7.	K3	CO3	12.1.1, 12.1.2, 12.2.2, 12.3.2	Find the dimension of a rectangular box of maximum capacity whose surface area is given when (i) box is open at the top. (ii) box is closed.	5
8.	K3	CO3	1.3.1, 2.2.3, 2.4.1	If $u^3+v^3+w^3 = x+y+z$, $u^2+v^2+w^2 = x^3+y^3+z^3$ and $u+v+w = x^2+y^2+z^2$, then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = \frac{(x-y)(y-z)(z-x)}{(u-v)(v-w)(w-u)}$.	5
9.	K3	CO3	5.1.1, 10.1.2, 10.3.1,	Divide 24 into three parts such that the continued product of the first, square of the second and the cube of the third may be maximum.	5
10.	K3	CO3	1.2.1, 1.3.1, 2.1.3, 2.4.1, 2.4.2	Expand sin *xy* in powers of (x-1) and $(y-\pi/2)$ upto second degree term.	5

Answers:

1. $1+(x-1)+(x-1)(y-1)+\frac{1}{2}(x-1)^2(y-1)+\cdots\ldots\ldots;\ 1.1021$
2. **a=1/6, b=2/3, required term = -(1/36) x^4**
3. **$2w = u(3v-u^2)$**
4. **M**ax value at $(\frac{a}{3},\frac{a}{3})$ is $\frac{a^3}{27}$
5. **Rs 43.20/-**

7. (i) $x=y=\sqrt{\frac{s}{3}}, z=\frac{1}{2}\sqrt{\frac{s}{3}}$ **(ii)** $x=y=z=\sqrt{\frac{s}{6}}$

9. 4.8, 12

10. $1-\frac{\pi^2}{8}(x-1)^2-\frac{\pi}{2}(x-1)(y-\frac{\pi}{2})-\frac{1}{2}(y-\frac{\pi}{2})^2$