THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

JANUARY – APRIL 2019 TRIMESTER

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING AND FINANCE

REGULAR PROGRAMME

CID 081: INTERMEDIATE BUSINESS MATHEMATICS

Date: APRIL 2019	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. a) The average costs for a commodity is given by AC = x + 4 + $\frac{4}{x}$. Find the total and marginal cost functions. Also find output when average cost is equal to marginal cost. **(10 marks)**

b) The total cost C in making x units of a product is given by the following function: C = $0.00003x^3 - 0.045x^2 + 8x + 25{,}000$
Find the marginal cost at 1000 units output. **(10 marks)**

c) A committee of four (4) must be chosen from 3 women and 4 men. Calculate:

a) In how many ways the committee can be chosen
b) In how many ways 2 men and 2 women can be chosen
c) Probability that the committee consists of 2 men and 2 women.
d) The probability that committee consists of at least of 2 women.

(10 marks)

Q2. Differentiate with respect to x the following:

i. $\frac{d}{dx}(ax^3 + 3bx^2 + 3cx + d)$

ii. $\frac{d}{dx}(9x^5 - 4x^3 - 12)$

iii. $\frac{d}{dx}(xe^x)$

iv. $\frac{d}{dx}$(√x logx)

v. $\frac{d}{dx}(\frac{logx}{x^2})$ **(20 marks)**

Q3. Integrate the following:

i. $\int \sqrt{x}dx$

ii. $\int(x^3 + 3x^2 + 7x -13)dx$

iii. $\int e^x + x^e + e^e)dx$

iv. $\int(x^2 + 1)(2x^3 – 3)dx$

v. $\int(\frac{a}{x} + \frac{b}{x^2} + \frac{c}{x^3} + \frac{d}{x^4})dx$ **(20 marks)**

Q4. 1) Write down the first five terms of the sequence given by $u_n = (-1)^{n+1}/n$ **(3 marks)**

2) An Arithmetic Progression (AP) is given by *k, 2k/3, k/3, 0, ….*

i) Find the sixth term. **(2 marks)**

ii) Find the *nth* term. **(2 marks)**

iii) If the 20th term is equal to 15, find *k.* **(3 marks)**

3) Find the sum of the Arithmetic series with the first term 1, common difference 3, and last term 100. **(3 marks)**

4) An Arithmetic progression has 3 as its first term. Also the sum of the first 8 terms is twice the sum of the first 5 terms. Find the common difference. **(3 marks)**

5) How many terms in the geometric progression, 1, 1.1, 1.21, 1.331, ….will be needed so that the sum of the first n terms is greater than 20? **(4 marks)**

CID 081 INTERMEDIATE BUSINESS MATHEMATICS FORMULAE

1. 0! = 1
2. ${}^nP_r$ or ${}_nP_r = \frac{n!}{(n-1)!}$
3. ${}^nP_n = n!$
4. n! = n(n-1)(n-2)(n-3)…1
5. ${}^nP_r$ = n(n-1)(n-2)(n-3)… [n-(r-1)]
6. ${}^nC_r$ or ${}_nC_n = \frac{n(n-1)(n-2)(n-3)\ldots[n-(r-1)]}{r!}$
7. ${}^nC_r = \frac{n!}{r!(n-1)!}$ Where r = 0.1,2,3… n

8. ${}^{n}C_{0} = 1$
9. ${}^{n}C_{n} = 1$
10. ${}^{n}C_{n-r} = {}^{n}C_{r}$, where r = 0,1,2,3… n
11. ${}^{n}C_{r} + {}^{n}C_{r-1} = {}^{n+1}C_{r}$
12. ${}^{n}C_{n-r} = \frac{n!}{(n-1)!\,r!}$ where r = 0,1,2,3… n
13. $\frac{d}{dx}(x^{n}) = nx^{n-1}$
14. $\frac{d}{dx}$ (constant) = 0 (zero)
15. $\frac{d}{dx}$ (constant x function) = constant x $\frac{d}{dx}$ x function
16. $\frac{d}{dx}$ (u + v) = $\frac{du}{dx} + \frac{dv}{dx}$
17. $\frac{d}{dx}$ (u + v + w +…) = $\frac{du}{dx} + \frac{dv}{dx} + \frac{dw}{dx} + \ldots$
18. $\frac{d}{dx}$ (u - v) = $\frac{du}{dx} - \frac{dv}{dx}$
19. $\frac{d}{dx}$ (u - v - w -…) = $\frac{du}{dx} - \frac{dv}{dx} - \frac{dw}{dx} - \ldots$
20. $\frac{d}{dx}$ (uv) = u$\frac{dv}{dx}$(v) +v $\frac{du}{dx}$(u)
21. $\frac{d}{dx}(\frac{u}{v}) = \frac{v\frac{du}{dx}u - u\frac{dv}{dx}v}{v^{2}}$ = Dr¿¿
22. $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}}$
23. $\frac{d}{dx}(a^{x}¿ = a^{x}\log a$
24. $\frac{d^{2}y}{dx^{2}} = \frac{d}{dx}.\frac{dy}{dx}$
25. $\frac{d}{dx}$(uvw) = uv$\frac{dw}{dx}$ + uw$\frac{dv}{dx}$ +vw$\frac{du}{dx}$
26. $\int x^{n}\,dx = \frac{x^{n+1}}{n+1}$ + c
27. $\int \frac{1}{x}dx$ = $\log_{e}$x + c
28. $\int e^{ax}\,dx = \frac{e^{ax}}{a}$ + c

29. $\int a^x dx = \frac{a^x}{\log a} + c$

30. $\int k dx = kx + c$

31. $\int e^x dx = e^x + c$

32. $\int 1.dx = x + c$

33. $\int ¿¿ = \frac{1}{a}.¿¿ + c$

34. $\int \frac{dx}{ax+b} = \frac{1}{a}.\log (ax + b) + c$

35. $\int e^{ax+b} dx = \frac{1}{a}.e^{ax+b} + c$

36. $\int u\frac{dv}{dx}dx = uv - \int v\frac{du}{dx}dx + c$ OR $\int uvdx = uv^1 + u'v^2 + u''v^3 - u'''v^4 - \ldots$

37. $\int_{-a}^{a} f(x)dx = \begin{cases} 2\int_0^a f(x)dx = if\ f(x)\ is\ even \\ 0\ if\ f(x)\ is\ 0\ dd \end{cases}$

38. $\int_a^h f(x)dx = [g(x) + c]_a^h$❑

$= \{g(b)+c\} - \{g(a)+c\}$

$= g(b) - g(a)$

39. $\int \frac{f'(x)}{f(x)}dx$ where f'(x) is the derivative of f(x)

Put f(x) = t, then f'(x)dx = dt

Thus $\int \frac{f'(x)}{f(x)}dx = \int \frac{dt}{t}$ log t = log f(x)

40. $\int ¿¿$ put f(x) = t, then f'(x)dx = dt

Thus ¿ = $\int t^n dt = \frac{t^{n+1}}{n+1}$ = ¿¿

41. $\int f'(ax+b)dx$, put (ax + b) = i, then adx = dt, dx = $\frac{dt}{a}$

Thus $\int f'(ax+b)dx = \int f'(t)\frac{dt}{a} = \frac{1}{a}\int f'(t)dt = \frac{1}{a}[f(t)] = \frac{f(ax+b)}{a}$

42. Revenue = price times quantity
R(x) = Px

43. Profit = revenue minus cost
P(x) = R(x) – C(x)

44. Breakeven point (BEP)
Revenue = Cost R(x) = C(x)

Profit = zero (0) P(x) = 0

END