THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

P.O. Box 62157

00200 Nairobi - KENYA

Telephone: 891601-6

MAIN EXAMINATION

JANUARY – APRIL 2019 TRIMESTER

FACULTY OF COMMERCE

DEPARTMENT OF ACCOUNTING AND FINANCE

REGULAR / ODEL PROGRAMME

CMS 121: BUSINESS MATHEMATICS

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

Q1. a) Given that
A = {3, 7, -5, 0, 13}
B = {0, 17, 3, Blue, @}
C = {Pink, @, 3, 17}
Find A\{An(B\C)'}u(BnC) **(5 marks)**

b) Some forty people were asked about their preferences as far as the daily newspapers are A, B and D. it was noted that those who buy newspaper A do not buy newspaper D and vice versa. Six (6) of them were found to buy newspaper D only, seven (7) bought newspapers A and B. Five (5) bought newspaper B only while 10 bought newspaper A only. Four (4) of them do not buy any single paper.

Required:

a) Determine the number of persons who buy at least newspaper B **(2.5 marks)**

b) Identify the most popular newspaper. **(2.5 marks)**

c) Differentiate
   a) $3x^5 + 4x^3 – x – 3$ **(2.5 marks)**
   b) $3x^2 + 2\sqrt{x}$ **(2.5 marks)**
   c) $4 + \frac{3}{x}$ **(2.5 marks)**

d) $\frac{2x+\sqrt{x}}{x^2}$ **(2.5 marks)**

Q2. 1) A company that produces mirrors for telescopes estimates the values for the following functions when 1200 mirrors are produced: R(1200)= \$30,000 , C(1200)= \$23,000 , MR(1200)= \$400 , and MC(1200)= \$100 . Due to a change in the economy, the revenue function decreased by \$5000 and cost increased by 10%. Determine the revenue, cost, marginal revenue, and marginal cost under the new economic conditions if 1200 mirrors are produced. **(10 marks)**

2) Find $\frac{dy}{dx}$ if y = (x + $\frac{1}{x}$)log x **(5 marks)**

3) If u = $2x^2 + 3xy + 4y^2$ find $\frac{du}{dx}$ and $\frac{du}{dy}$ **(5 marks)**

4) Evaluate $\int (\frac{x^2+2x-1}{\sqrt{x}}¿)dx¿$ **(5 marks)**

Q3. Find the maximum and minimum values of the following functions:

i) $x^3 - 3x^2 - 9x + 27$ **(5 marks)**

ii) $\frac{2}{3}x^3 + \frac{1}{2}x^2 - 6x + 8$ **(5 marks)**

iii) $x^4 + 2x^3 - 3x^2 - 4x + 4$ **(5 marks)**

iv) $8x^5 - 15x^4 + 10x^2$ **(5 marks)**

Q4. Of the 8 equal candidates for a job, 3 are qualified accountants, 4 are graduates and 2 have neither of these qualifications. Find:

i) The probability that a graduate gets the job. **(6 marks)**

ii) Given that a qualified accountant has got the job, the probability that he is a graduate. **(7 marks)**

iii) The probability that a qualified accountant gets the job, given that a graduate did not get the job. **(7 marks)**

CMS 121 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. ${}^{n}P_{r}$ = n(n-1)(n-2)(n-3)… [n-(r-1)]
6. ${}^{n}C_{r}$ or ${}_{n}C_{n} = \frac{n(n-1)(n-2)(n-3)\ldots[n-(r-1)]}{r!}$
7. ${}^{n}C_{r} = \frac{n!}{r!(n-1)!}$ 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