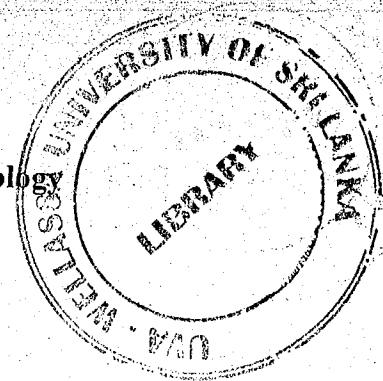


Uva Wellassa University, Sri Lanka

End Semester Examination - Semester II

June 2008

SCT 102-3 Basic Mathematics and Engineering Technology



PART B

Answer for all questions (04 Questions)

Time: Two hours and thirty minutes (2½ hours)

Q 01. Simplify

i)
$$\frac{9^{1/3} \times 27^{-1/2}}{3^{-1/6} \times 3^{-2/3}}$$

ii)
$$\log_{10}(x + 3) + \log_{10}x = 1$$

Q 02. Simplify

- a) Pumps A, B and C, working together, can fill a tank in 2 hours. If only A and C are used, it would take 4 hours. If only B and C are used it would take 3 hours. How long would it take for each to fill the tank, working separately?

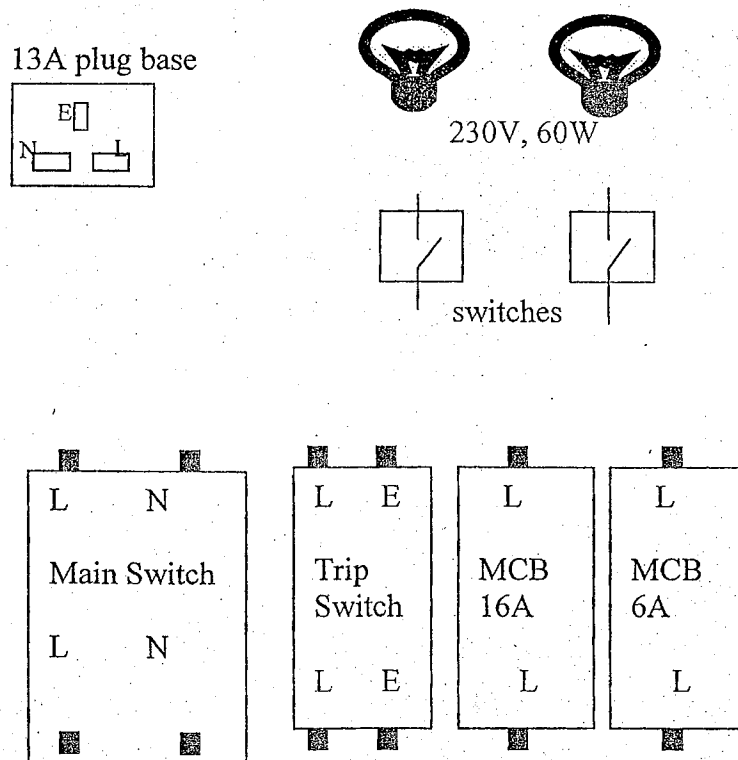
b)
$$A = \begin{pmatrix} 2 & x & 1 \\ -1 & 0 & 3 \\ 6 & -2 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 2 & -5 \\ 3 & 1 \\ -7 & 4 \end{pmatrix}$$

Find

- (i). 5A
- (ii). AB
- (iii). BA
- (iv). $\frac{B}{2}$

Q 03

- a) By giving examples explain what is meant by "Resonance"?
- b) What is the theory behind in fiber optics communication? Briefly explain it by giving necessary drawings.
- c) How we can generate electricity? What energy sources are used to generate electricity in Sri Lanka?
- d) You are provided with following electrical components and necessary wires. By stating the standard colors of wires, connect the house wiring system properly. (all notations have usual meanings)



Q 04. Write short notes on the following topics.

- a) Orthographic views
- b) Cleaner production
- c) Manufacturing process
- d) Diesel engine
- e) Manufacturing a hollow metal tube



Basic formulas in calculus

Differentiation rules

$$1. \frac{d(\ln x)}{dx} = \frac{1}{x}$$

$$2. \frac{d(e^x)}{dx} = e^x$$

$$3. \frac{d(\sin x)}{dx} = \cos x$$

$$4. \frac{d(\cos x)}{dx} = -\sin x$$

$$5. \frac{d(\tan x)}{dx} = \sec^2 x$$

$$6. \frac{d(\sec x)}{dx} = \sec x \tan x$$

$$7. \frac{d(\cot x)}{dx} = -\operatorname{cosec}^2 x$$

$$8. \frac{d(\operatorname{cosec} x)}{dx} = -\operatorname{cosec} x \cot x$$

Integration rules

$$1. \int \frac{1}{x} dx = \ln|x| + C$$

$$2. \int e^x dx = e^x + C$$

$$3. \int \sin x dx = -\cos x + C$$

$$4. \int \cos x dx = \sin x + C$$

$$5. \int \sec^2 x dx = \tan x + C$$

$$6. \int \sec x \tan x dx = \sec x + C$$

$$7. \int \operatorname{cosec}^2 x dx = -\cot x + C$$

$$8. \int \operatorname{cosec} x \cot x dx = -\operatorname{cosec} x + C$$

$$9. \int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1}\left(\frac{x}{a}\right) + C$$

$$10. \int \frac{1}{a^2 + x^2} dx = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + C$$

$$11. \int \frac{1}{x\sqrt{x^2 - a^2}} dx = \sec^{-1}\left(\frac{x}{a}\right) + C$$

$$12. \int \frac{\frac{1}{2}f'(x)}{\sqrt{f(x)}} dx = \sqrt{f(x)} + C$$

$$13. \int \frac{f'(x)}{f(x)} dx = \ln|f(x)| + C$$

$$14. \int \frac{1}{\sqrt{x^2 + a^2}} dx = \ln|x + \sqrt{x^2 + a^2}| + C$$
