SOLUTION – MANAGEMENT ACCOUNTING & CONTROL (PART B) NOV 2008

QUESTION 4

(a) Characteristics of Normal Distribution:

(i) Shape: It is bell-shaped

(ii) Symmetry: It is symmetric about the mean

(iii) Area: Total area under the curve is 1

(iv) Random variable: It is continuous and takes all real numbers.

(b) Let x be the number of engines sold per month at Abossey Okai

X	P(X)	XP(X)	$X^2P(X)$
200	0.1875	37.5	7500
150	0.3125	46.875	7031.25
450	0.125	56.25	25312.5
300	0.125	37.5	11250
250	0.25	62.5	15625
		240.625	66718.75

$\therefore E(X) = 240.625$

$\sigma_x = \sqrt{E(X^2) - [E(X)]^2}$

$= \sqrt{66718.75 - 240.625^2}$

$= 93.906$

$\therefore X \sim N(240.625, 93.906^2)$

(i) $P(200 \leq X \leq 400) = P\left(\frac{200 - 240.625}{93.906} \leq Z \leq \frac{400 - 240.625}{93.906}\right)$

$= P(-0.43 \leq Z \leq 1.70)$

Where $Ƶ = \frac{X - N}{\sigma} \sim N(0,1)$

From tables, $P(200 \leq X \leq 400) = 0.1664 + 4554$

$= \underline{\underline{0.6218}}$

$$P\ (X > 500) = P\left(Ƶ > \frac{500 - 240.625}{93.906}\right)$$

$$= P\ (Ƶ < 2.76)$$

From tables, $P(X > 500) = \underline{\underline{0.0029}}$

(iii) Let w be the maximum sales/month that gives a probability of 0.4

Then $P\ (x > w) = 0.4$

$$P\left(Ƶ \leq \frac{w - 240.625}{93.906}\right) = 0.4$$

From tables , Z = -0.25

∴ $\frac{w - 240.625}{93.906} = -0.25$

$w = -0.25 \times 93.906 + 240.625 = 217$

Hence, maximum expected revenue/month = 350 x 217
= $\underline{\underline{GH¢75950}}$

QUESTION 5

(a) (i) $y = (4x^3 + 6x^2)(3x^2 + 6x)$

$\frac{dy}{dx} = (4x^3 + 6x^2)(6x + 6) + (12x^2 + 12x)(3x^2 + 6x)$

$= 24x^4 + 24x^3 + 36x^3 + 36x^2 + 36x^4 + 72x^3 + 36x^3 + 72x^2$

$= 60x^4 + 168x^3 + 108x^2$

(ii) $\int \sqrt{x}\, dx = \int x^{½} dx$

$= \frac{X^{½} + 1 + c}{½ + 1}$

$= \frac{X^{3/2}}{3/2} + c$

$= 2/3\ X^{3/2} + c$

$= 2/3\ (\sqrt{x})^3 + c$

MC = 32x - 3182

TC $= \int (32x - 3182)dx$
$= 16x^2 - 3182x + c$

But C = 1000

TC $= 16x^2 - 3182x + 1000$

MR = 18

TR $= \int 18\, dx$

$= 18x$

Profit (P) = TR - TC

$= 18x - [16x^2 - 3182x + 1000]$

$= 18x - 16x^2 + 3182x - 1000$

$= 16x^2 + 3200x - 1000$

(ii) At maximum profit, $\frac{dp}{dx} = 0$

$P = -16x^2 + 3200x - 1000$

$\frac{dp}{dx} = -32x + 3200$

$\frac{dp}{dx} = 0$

$-32x + 32000 = 0$

$32x = 3200$

$x = \frac{3200}{32}$

$= \underline{\underline{100}}$

(iii) When x = 100

$P = 16(100)^2 + 3200(100) - 1000$

$= 160000 + 320000 - 1000$

$= 159000$

QUESTION 6

a) Regression relates a mathematical relationship on a bivariate data.

Correlation describes the nature of spread of a bivariate data about a line or curve.

b) Month Advertisement Sales

	(GH¢00) (x)	(GH¢00) (y)	xy	x^2	y^2
January	4	20	80	16	400
February	8	56	448	64	3136
March	12	64	768	144	4096
April	6	28	168	36	784
May	12	72	864	144	5184
June	7	44	308	49	1936
July	6	36	216	36	1296
August	8	50	400	64	2500
September	10	60	600	100	3600
October	11	54	594	121	2916
November	9	52	468	81	2704
December	14	76	1064	196	5776
	$\sum x = 107$	$\sum y = 612$	$\sum xy = 5978$	$\sum x^2 = 1051$	$\sum y^2 = 34328$

$\sum x = 107$; $\sum y = 612$; $\sum xy = 5978$

$\sum x^2 = 1051$; $\sum y^2 = 34328$

Graph

$$= \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (1051) - (107)^2}$$

$$= \frac{(12)(5976) - (107)(612)}{(12)(1051) - (107)^2}$$

$$= 5.38$$

$$a = \frac{\sum y}{n} - b \frac{\sum x}{n}$$

$$= 51 - (5.38)(8.9)$$

$$= 3.12$$

$\therefore$ $Y = 3.12 + (5.38)x$

(iii) If the company advertises at GH¢1600, then sales

$$y = (3.12) + (5.38)(16)$$

$$= 89.2$$

Therefore, the sales would be GH¢8920

(iv) $r = \dfrac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n 2x^2 - (\sum x)2}\ \sqrt{n2y^2 - (\sum y)^2}}$

$= \dfrac{(12)(5976) - (107)(612)}{\sqrt{(12)(1051) - (107)^2}\ \sqrt{(12)(34328 - (612)^2}}$

$\pm .01$

$= 0.944$

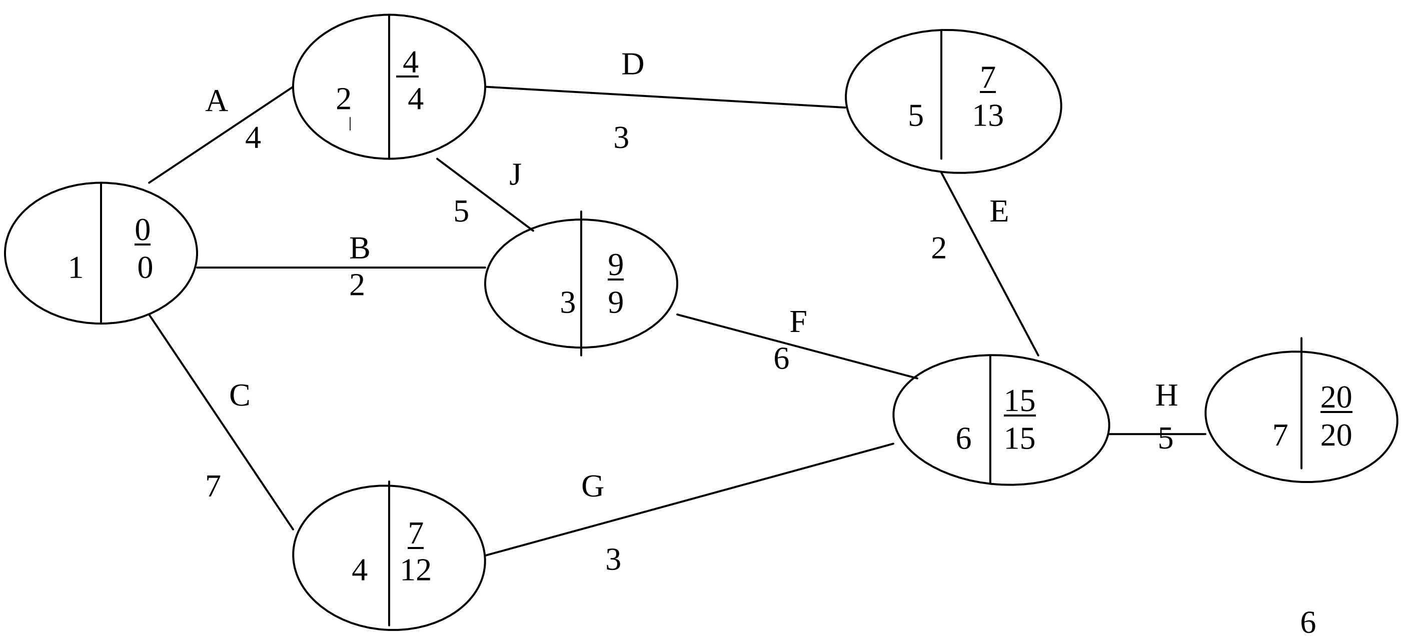
The correlation of +94.4% is positively highly correlated.

QUESTION 7

a) (i) A free float is the amount of spare time available given the most favourable conditions that can be used up without affecting the float of succeeding activities.

(ii) Independent float is the amount of time by which the activity duration can be expanded without affecting the floats of succeeding or preceding activities.

b) (i) Network Diagram: Normal Schedule



(a) Free float is the amount of time by which an activity can be lengthened or re-scheduled without affecting the earliest start of any following activity.

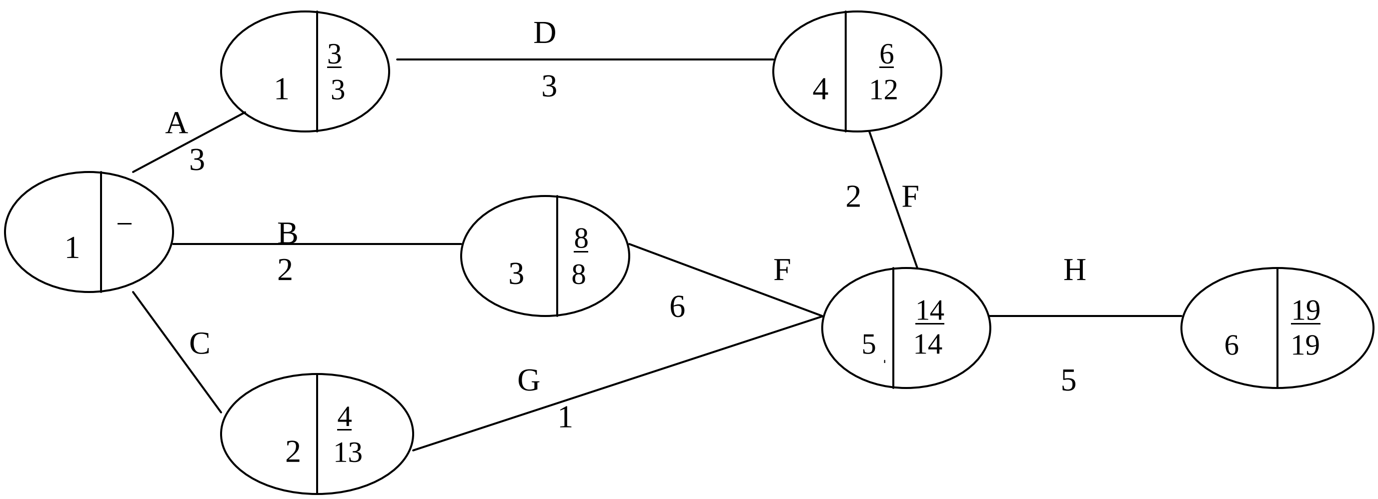
(b) Independent float has no effect on earlier or later activities

(c) When activity is crushed

The duration will be = 19 days as shown on the diagram below

The cast of the profit = 600 + 200 + 700 + 250 + 100 + 500 + 300 + 160 + 160

= GH¢2970.00



(ii) From the network diagram the critical path is Activities A, J, F, H

The average daily cost = $\frac{\text{cost of profit}}{\text{Number of days of project}}$

Cost of project = 2770
Duration of project = 20 days
:. Average daily cost = $\frac{2770}{20}$ = GH¢138.50

(iii) Free float of activity G
= Duration between the earliest times of both events minus activity duration
= 15 - 7 - 3 = 5 days

(iv) From the network diagram of the normal schedule, the critical path = A, J, F, H

Activity on the critical path that has to be crushed is A. Because all the other activities on the critical path costs and duration did not change.