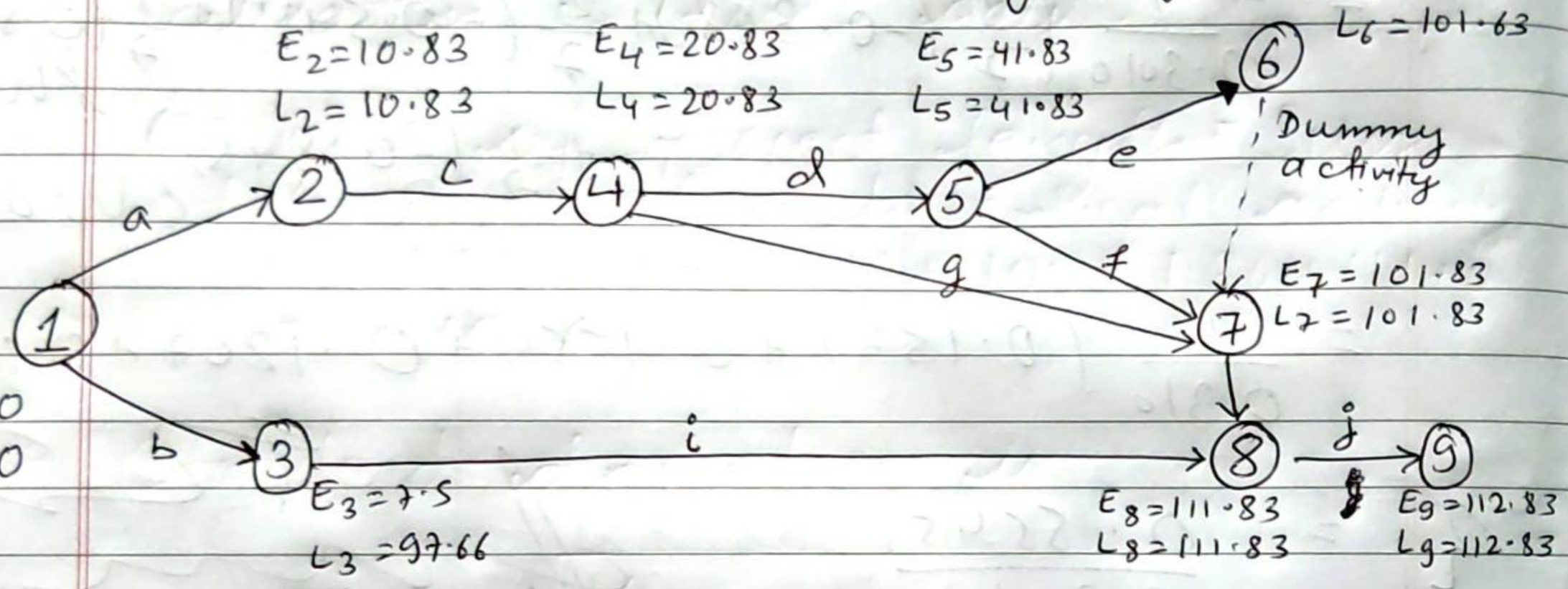
1906534 Ankit Raj

Answer 4)

Network diagram for given problem is shown in following fig:



Expected time value for activity of given network is listed in table below along with three variance.

Activity	Time estimates				Variance
	t_p	t_m	t_o	$t_e = \frac{t_o + 4t_m + t_p}{6}$	$\sigma = 2m\left(\frac{t_p - t_o}{6}\right)^2$
a	20	10	5	10.83	6.25
b	12	7	5	7.5	1.36
c	12	10	8	10	0.44
d	40	20	6	21	32.11
e	90	60	30	60	100
f	14	10	7	10.17	11.36
g	50	30	20	31.67	25
h	12	10	8	10	0.44
i	6	4	3	4.17	0.25
j	1	1	1	1	0

1906534 Ankit Raj

Value of earliest & latest time is calculated on basis of expected time te as follows:

Forward pass method	Backward pass method
$E_1 = 0$	$L_9 = E_9 = 112.83$
$E_2 = E_1 + t_{1-2} = 0 + 10.83 = 10.83$	$L_8 = L_9 - t_{8-9} = 112.83 - 1 = 111.83$
$E_3 = E_1 + t_{1-3} = 0 + 7.5 = 7.5$	$L_7 = L_8 - t_{7-8} = 111.83 - 10 = 101.83$
$E_4 = E_2 + t_{2-9} = 10.83 + 10 = 20.83$	$L_6 = L_7 - t_{6-7} = 101.83 - 0 = 101.83$
$E_5 = E_4 + t_{4-5} = 20.83 + 21 = 41.83$	$L_5 = \min [L_6 - t_{5-6}]; t_7 - t_{5-7}]$
$E_6 = E_5 + t_{5-6} = 41.83 + 60 = 101.83$	$= \min [101.83 - 60; 10.83 - 10.17] = 41.83$
$E_7 = \max [E_4 + t_{4-7}, E_5 + t_{5-7}, F_6 + t_{6-7}]$	$L_4 = \min [L_5 - t_{4-5}, L_7 - t_{4-7}]$
$= \max [20.83 + 31.67, 41.83 + 10.17 + 101.83 + 0]$	$= \min [41.83 - 21, 101.83 - 31.67]$
$= 101.83$	$= 20.83$
$E_8 = \max [E_3 + t_{3-8}, E_7 + t_{7-8}]$	$L_3 = L_7 - t_{3-7} = 101.83 - 4.17$
$= \max [7.5 + 4.17; 101.83 + 10]$	$= 97.66$
$= 111.83$	$L_2 = L_4 - t_{2-4} = 20.83 - 10$
$E_9 = E_8 + t_{8-9}$	$= 10.83$
$= 111.83 + 1$	$L_1 = \min (10.83 - 10.83; 97.66 - 7.5)$
$= 112.83$	$= 0$

1906534

Hence critical path along with E-value and L-value are same i.e. 1-2-4-5-6-7-8-9 Expected project duration is 172.83 days.

Variance of project length = Sum of variance of each critical activity
= 6.25 + 0.44 + 32.11 + 100 + 1.36 + 44 + 0
= 140.6

Standard deviation is

$$\sigma = \sqrt{\text{variance}}$$
$$= \sqrt{140.6}$$
$$= 11.86$$

Thus,

$$Z = \frac{t_n - t_c}{\sigma} = \frac{80 - 112.83}{11.86} = -2.77$$

for $Z = -2.77$ probability of completing the project with 80 days-time i.e. 0.3%.