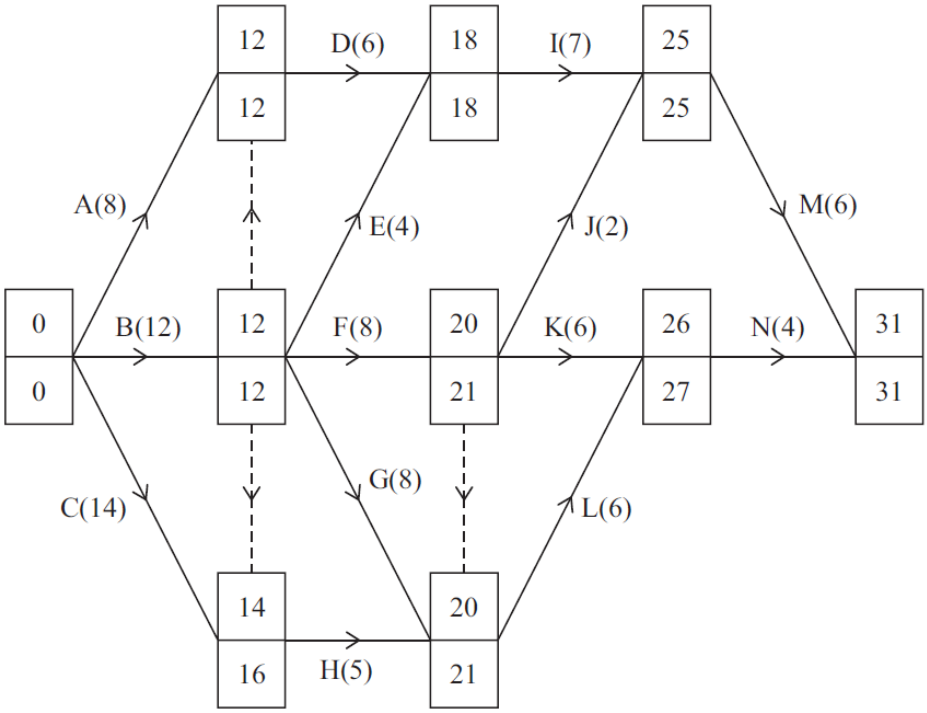
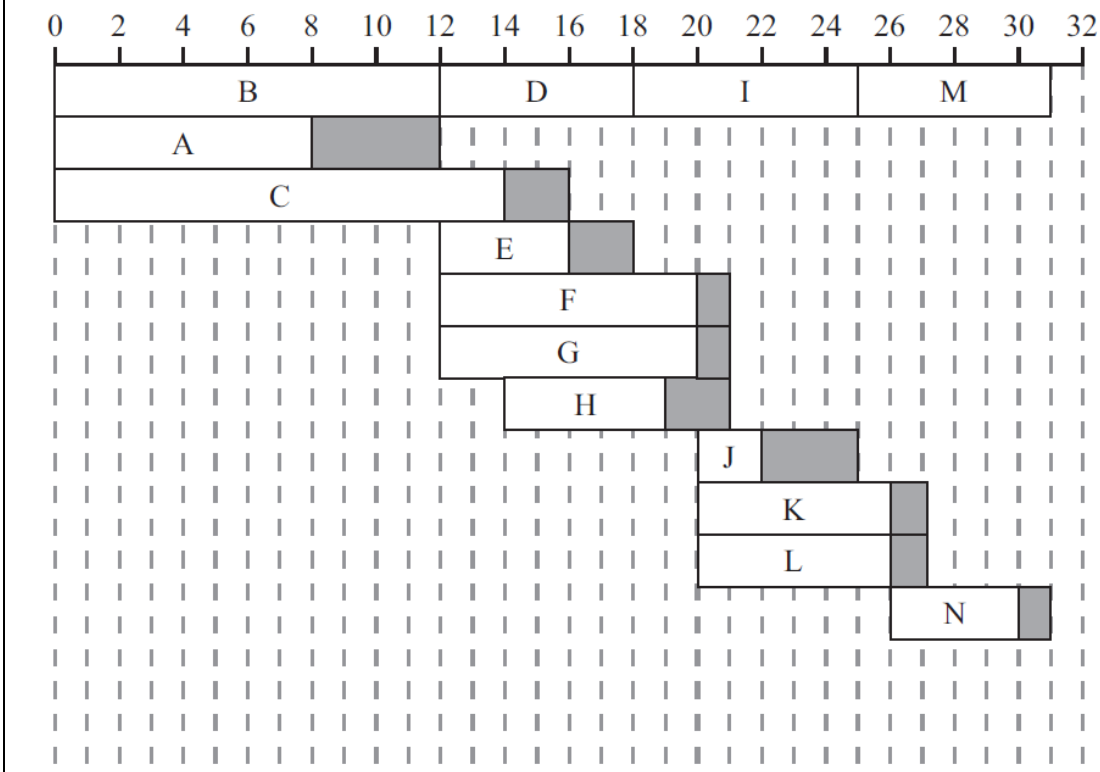
Question	Scheme	Marks
7. **(a)**		**B1** (DEFGH) **B1** (IJK) **B1** (LMN)
		(3)
(b)		**M1** **A1** **M1** **A1**
		(4)

Activity	IPA	Activity	IPA
A	-	H	B C
B	-	I	D E
C	-	J	F
D	A B	K	F
E	B	L	F G H
F	B	M	I J
G	B	N	K L

(c)	Lower bound = (8+12+14+6+4+8+8+5+7+2+6+6+6+4)/31 = 96/31 = 3.1 Therefore 4 workers required	**M1** **A1**
		(2)
(d)		**M1** **A1** **A1** **A1**
		(4)
(e)	At $13 < t < 14$ activities D, C, F and G must be happening and at $16 < t < 17$ activities D, F, G and H must be happening. Also activity E must be happening at either $13 < t < 14$ or $16 < t < 17$ so a total of five workers	**M1** **A1** **A1**
		(3)
		(16 marks)

Notes	
a1B1	Activities D, E, F, G and H correct
a2B1	Activities I, J and K correct
a3B1	Activities L, M and N correct
b1M1	**All** top boxes complete, values generally increasing in the direction of the arrows ('left to right'), condone one rogue value which is a number in a top box greater than the subsequent value
b1A1	CAO (top boxes)
b2M1	**All** bottom boxes complete, values generally decreasing in the opposite direction of the arrows ('right to left'), condone one rogue value which is a number in a bottom box greater than the previous value. Condone missing 0 and/or their 31 (at the end event) for the M mark only
b2A1	CAO (bottom boxes)
c1M1	Calculates 96 (+/-14)/"31" – a calculation using the sum of the activities (accept a total in the range 82 – 110) divided by their finish time or sight of awrt 3.1
c1A1	4 workers but must follow from a correct calculation (awrt 3.1) with no incorrect working seen (note an answer of 4 with no working is M0)
d1M1	Cascade Chart not a schedule. At least 9 activities including at least 5 floats
d1A1	Critical activities (BDIM) and at least 3 non-critical activities correct
d2A1	At least 7 non-critical activities correct
d3A1	CAO All 14 activities present (just once). No errors**.**
e1M1	A statement mentioning one of the following • 4 workers, 4 of D C E F G stated and time 13 – 14 • 4 workers, 4 of D E F G H stated and time 16 – 17 • 5 workers, either D C E F G or D E F G H stated and any time interval
e1A1	A correct statement of 5 workers with details of both the time **and** activities for one of the intervals. Candidates must give a time within one of the correct intervals. Either $13 < t < 14$, e.g. 13.5 (or 'on/during day 14') and state the correct activities D, C, E, F and G or $16 < t < 17$ (or e.g. 16.5 or 'on/during day 17') and the correct activities D, E, F, G and H. Please note an inequality for the time interval implying a time of 13, 14, 16 or 17 is incorrect. Answers given as an interval of time are acceptable provided the time interval stated is correct for all its possible values (e.g. time 13 – 14 or 'between 13 and 14' is A0)
e2A1	A fully correct statement mentioning both intervals and both correct groups of activities and stating 5 workers