



SUMMER-19 EXAMINATION

Model Answer

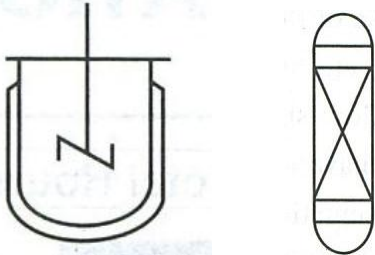
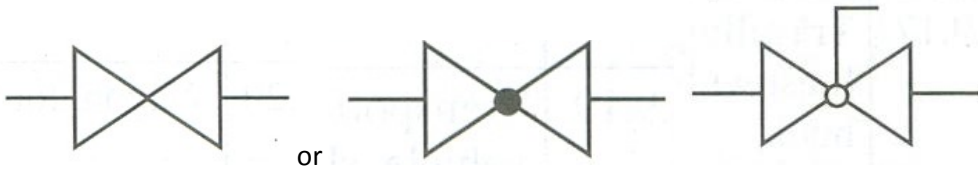

Subject Name: Chemical Engineering Drawing

Subject Code:

17647

Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1	A	Attempt any THREE	12
	a	Jacketed Batch Reactor and Catalytic Fixed bed Reactor 	2+2
	b	Gate valve and ball valve  or Needle valve and butterfly valve 	1 mark each



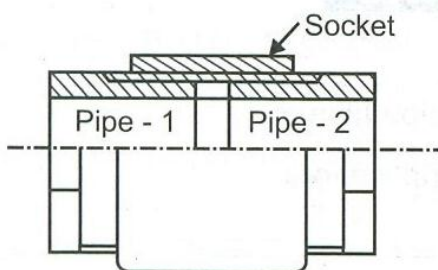

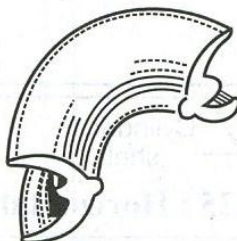
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	c	Socket joint 	4																																								
	d	Lessing ring  Intalox saddle 	2+2																																								
1	B	Attempt any ONE	08																																								
	a	Specification sheet of batch reactor <table><tr><th colspan="2">3 SPECIFICATION SHEET FOR BATCH REACTOR (JACKETED)</th></tr><tr><td>1.</td><td>Specification No. Date</td></tr><tr><td>2.</td><td>Number required Location</td></tr><tr><td>3.</td><td>Capacity (volumetric)</td></tr><tr><td>4.</td><td>Operating conditions</td></tr><tr><td>5.</td><td>Process materials handled</td></tr><tr><td>6.</td><td>Feed composition density viscosity</td></tr><tr><td>7.</td><td>Product mix. composition density viscosity</td></tr><tr><td>8.</td><td>Temperature Pressure</td></tr><tr><td>9.</td><td>Construction details</td></tr><tr><td>10.</td><td>Reactor shell : dia. height thickness</td></tr><tr><td>11.</td><td>Heads type</td></tr><tr><td>12.</td><td>Jacket heating surface Pressure on Jacket side</td></tr><tr><td>13.</td><td>Jacket : type</td></tr><tr><td>14.</td><td>Jacket : length dia. thickness</td></tr><tr><td>15.</td><td>Vessel connections :</td></tr><tr><td>16.</td><td>Inlet : No. size Outlet : No. size</td></tr><tr><td>17.</td><td>Manhole size Stuffing box opening</td></tr><tr><td>18.</td><td>Pressure gauge connection Thermowell pocket</td></tr><tr><td>19.</td><td>Jacket connections :</td></tr></table>	3 SPECIFICATION SHEET FOR BATCH REACTOR (JACKETED)		1.	Specification No. Date	2.	Number required Location	3.	Capacity (volumetric)	4.	Operating conditions	5.	Process materials handled	6.	Feed composition density viscosity	7.	Product mix. composition density viscosity	8.	Temperature Pressure	9.	Construction details	10.	Reactor shell : dia. height thickness	11.	Heads type	12.	Jacket heating surface Pressure on Jacket side	13.	Jacket : type	14.	Jacket : length dia. thickness	15.	Vessel connections :	16.	Inlet : No. size Outlet : No. size	17.	Manhole size Stuffing box opening	18.	Pressure gauge connection Thermowell pocket	19.	Jacket connections :	08
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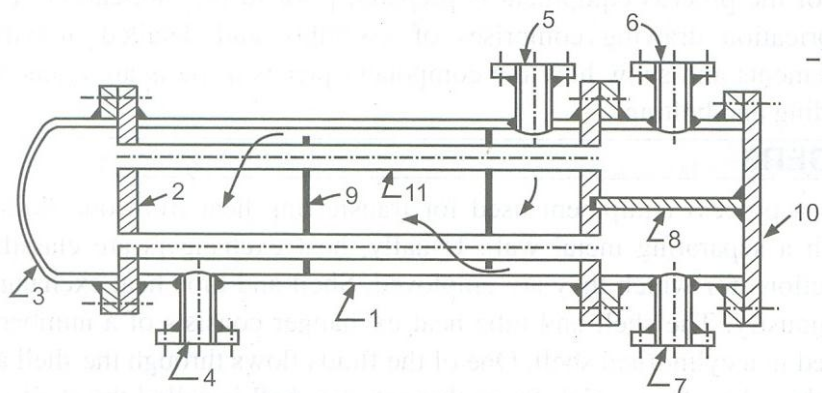
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20.	Steam inlet condensate size
21.	Water inlet water outlet jacket drain
22.	Agitator type Agitator/impeller dia.
23.	Speed
24.	Shaft : dia. length
25.	Blades : No. width breadth thickness
26.	Baffles : No. length width
27.	Stuffing box : Make type gaskets
28.	Special fittings : Relief valve
29.	Materials of construction
30.	Vessel Jacket Agitator
31.	Vessel nozzles Jacket nozzles
32.	Drive details
33.	Drive : type gear ratio arrangement (V/H)
34.	Motor : type HP phase cycles rpm class
35.	Design code Design pressure
36.	Hydrostatic test pressure
37.	Weight : dry unit full of water
38.	Services required :
39.	Steam : pressure flow
40.	Cooling water : Maximum temperature flow
41.	Support : type No. Bracket size
42.	Column support for bracket : size
43.	Remarks
	Prepared by Checked by Approved by
	Name and Address

b **Shell and tube heat exchanger**

08



1 - shell, 2 - tube sheet, 3 - cover, 4, 5 - shell side nozzle inlet/outlet
6, 7 - tube nozzle-inlet/outlet, 8 - pass partition, 9 - baffle, 10 - channel cover, 11 - tube
Section lines are not shown for shell, cover and nozzles



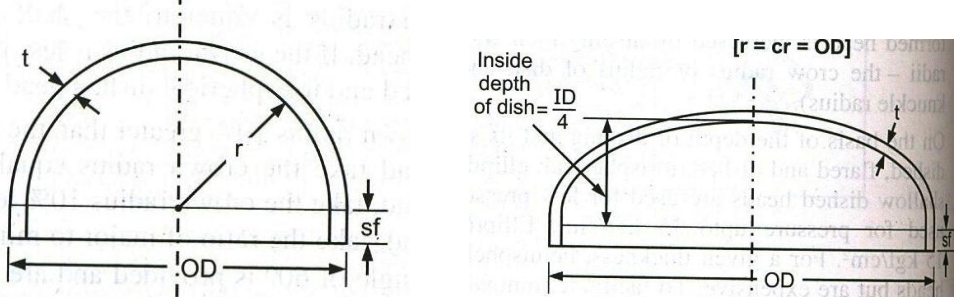
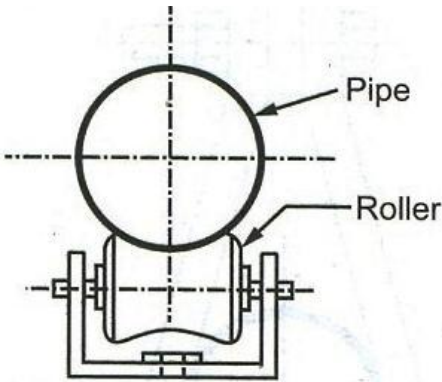
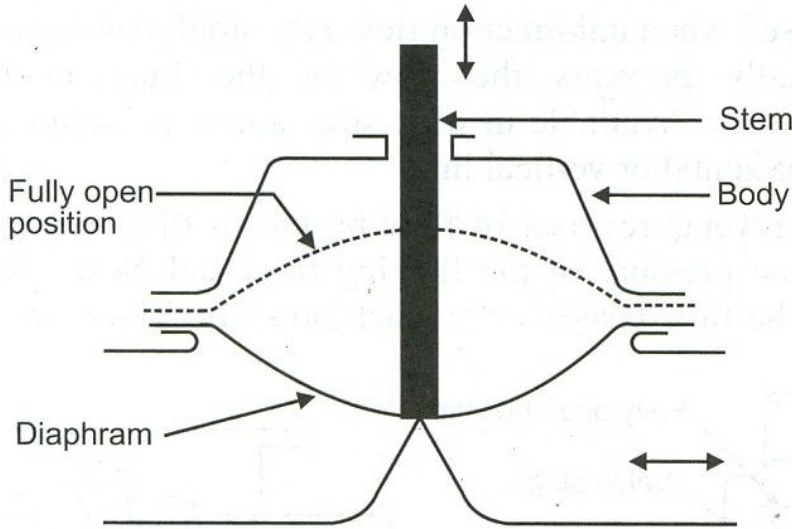
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2		Attempt any FOUR	16
a		Hemispherical dished head and Flange and shallow dished head 	2+2
b		Roller Support 	4
c		Diaphragm valve 	4



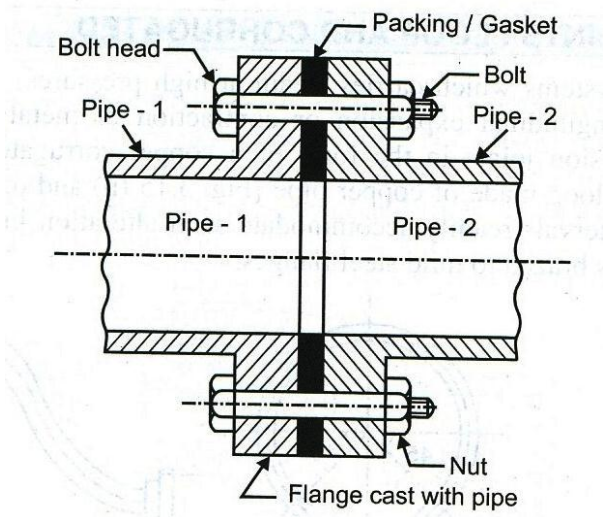
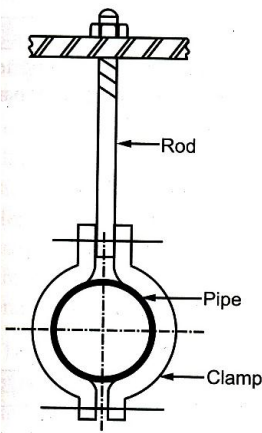
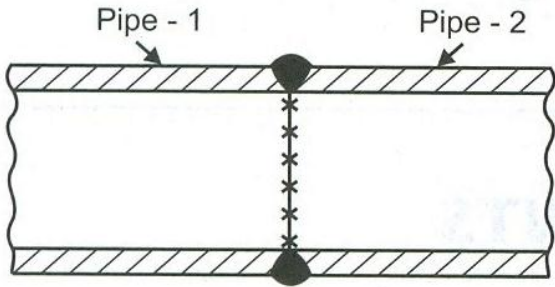
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d	CI Joint 	4
e	Single rod hanger 	4
f	Butt Welded Joint 	4



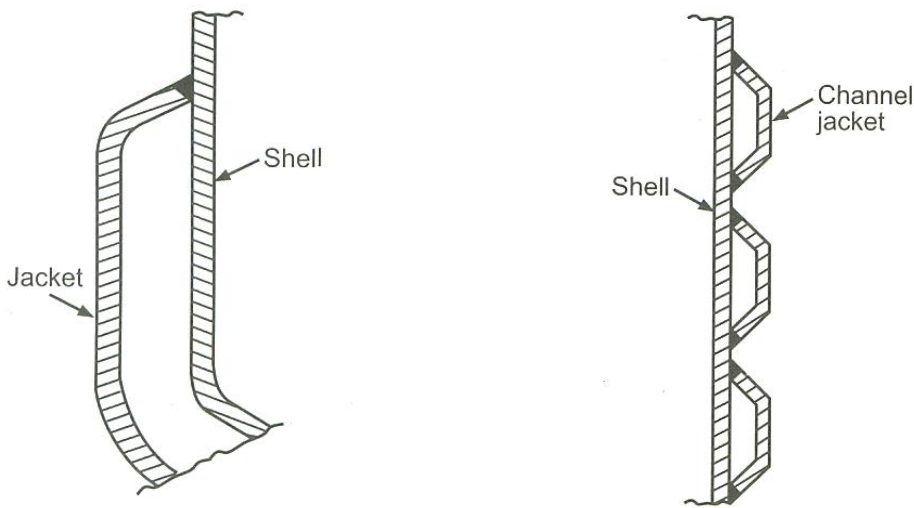
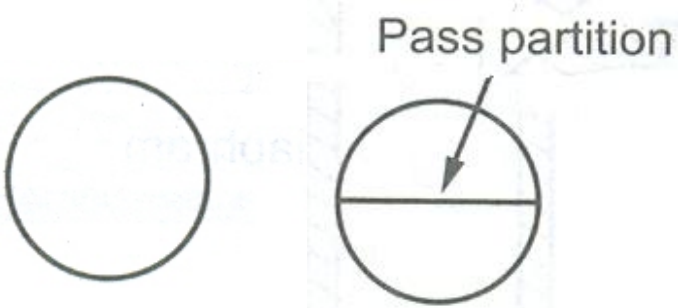
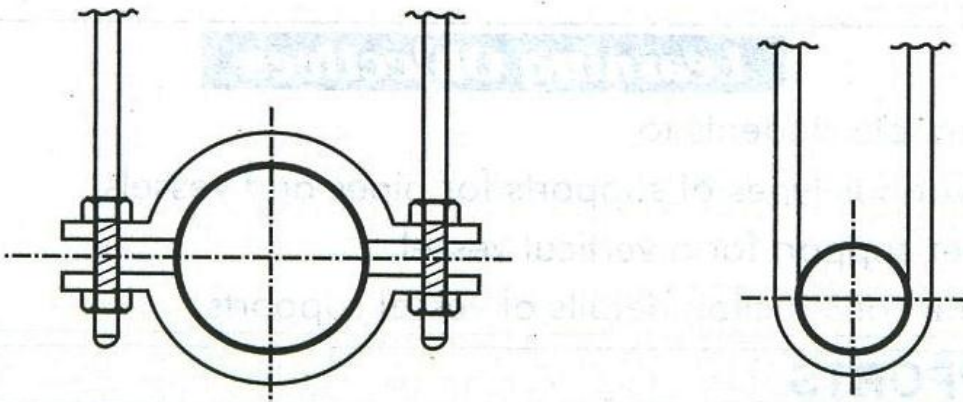
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3		Attempt any FOUR	16
	a	Jackets (Plain and Channel) 	2+2
	b	Tube Side passes in Shell 1) Single 2) Two 	2+2
	c	Double rod hanger support and Double U-bolt hanger 	2+2



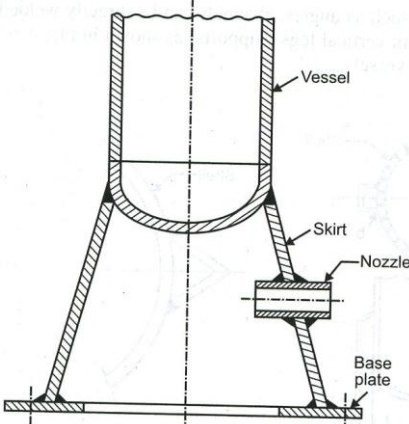
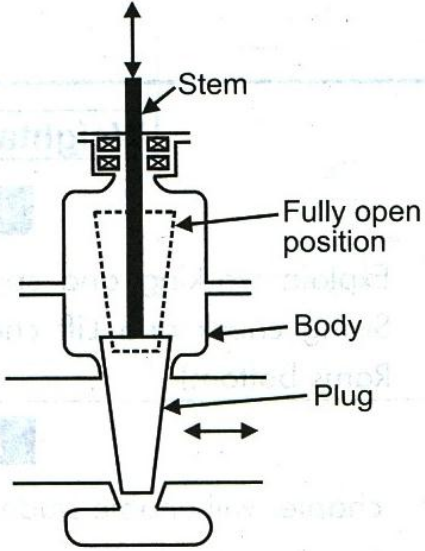
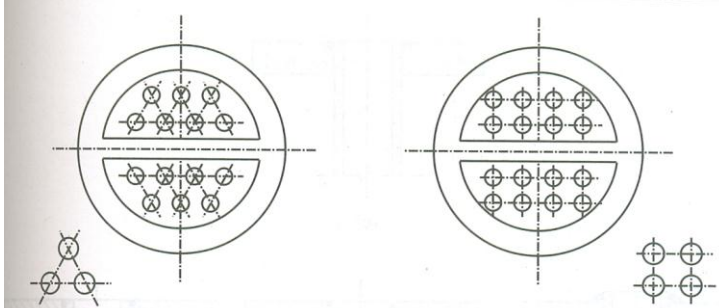
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d	Angular Skirt Support 	4
e	Gate Valve 	4
f	Tube sheet  (a) Triangular pitch of tubes (b) Square pitch of tubes	2+2



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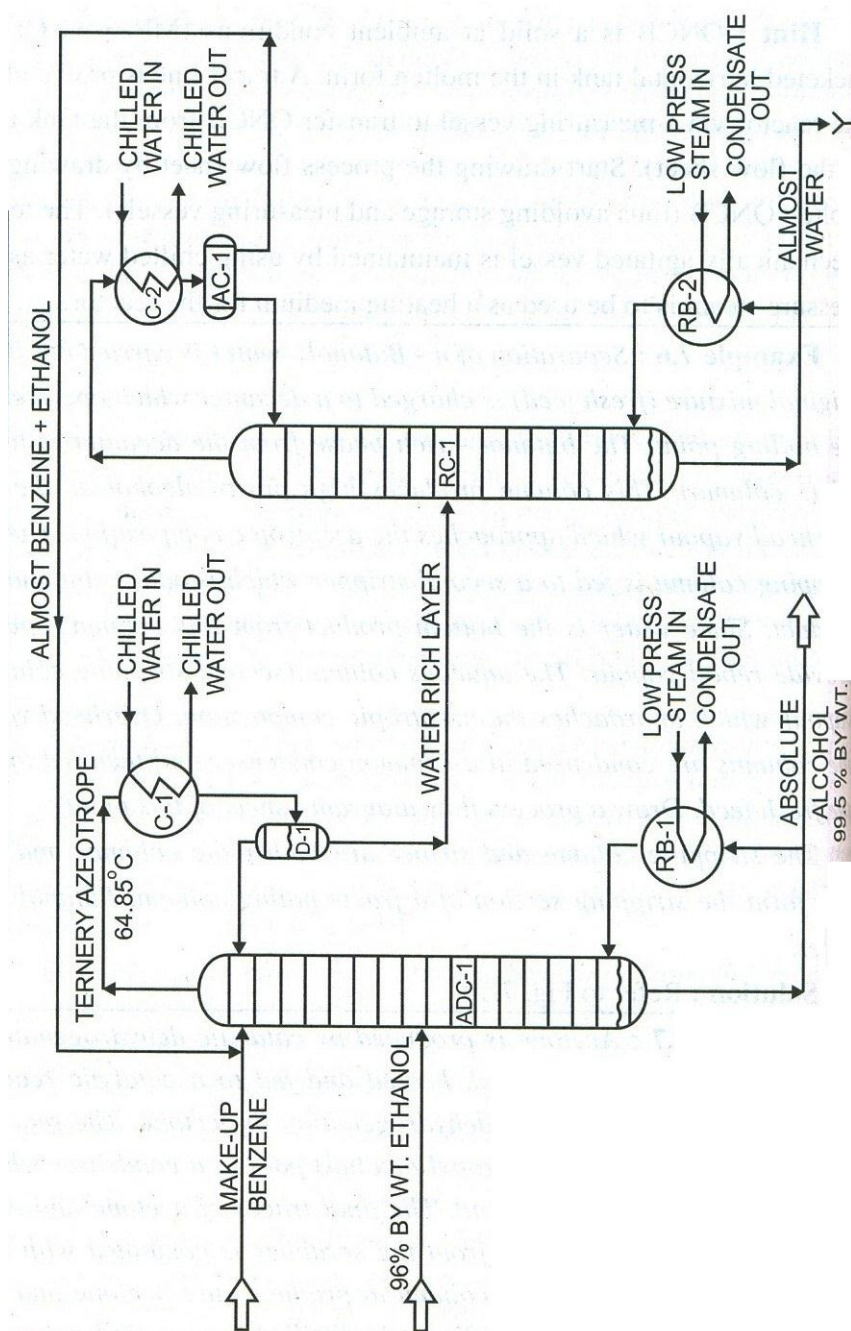
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4

Process Flow Diagram



16

(PFD 12
marks +
legend 4
marks)



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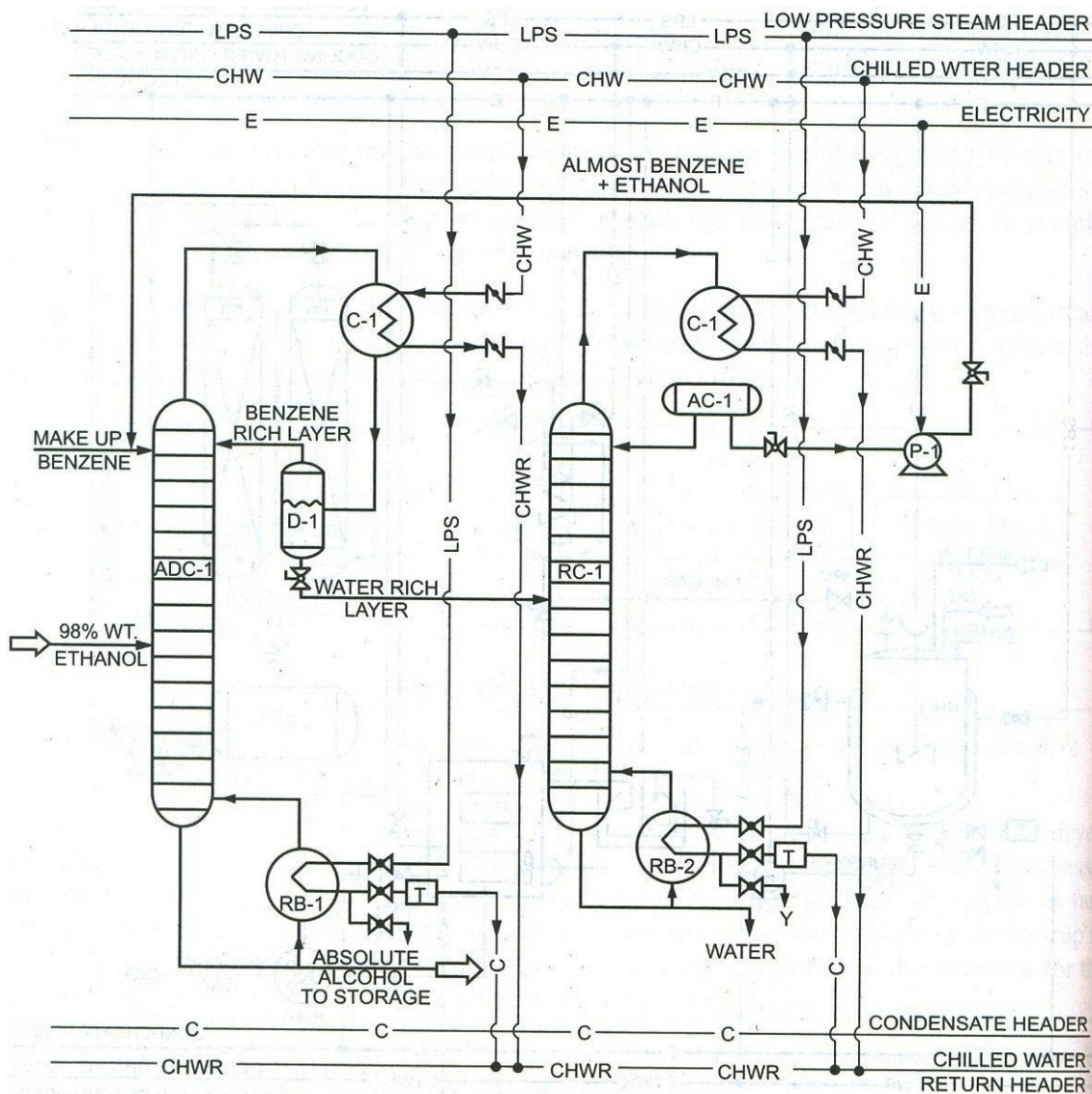
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NO.	CODE	DESCRIPTION
1	ADC-1	AZEOTROPIC DISTILLATION COLUMN
2	RC-1	RECOVERY COLUMN
3	C-1, C-2	CONDENSERS
4	RB-1,2	REBOILERS (THERMOSYPHON) TYPE
5	D-1	DECANTER
6	AC-1	ACCUMULATOR

5

a

Utility Line Diagram



10 marks
ULD + 2
marks
legend



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		<table><tr><th>NO.</th><th>CODE</th><th>DESCRIPTION</th></tr><tr><td>1</td><td>ADC-1</td><td>AZEOTROPIC DISTILLATION COLUMN</td></tr><tr><td>2</td><td>RC-1</td><td>RECOVERY COLUMN</td></tr><tr><td>3</td><td>C-1, C-2</td><td>CONDENSERS</td></tr><tr><td>4</td><td>RB-1,2</td><td>REBOILERS (THERMOSYPHON) TYPE</td></tr><tr><td>5</td><td>D-1</td><td>DECANTER</td></tr><tr><td>6</td><td>AC-1</td><td>ACCUMULATOR</td></tr></table>	NO.	CODE	DESCRIPTION	1	ADC-1	AZEOTROPIC DISTILLATION COLUMN	2	RC-1	RECOVERY COLUMN	3	C-1, C-2	CONDENSERS	4	RB-1,2	REBOILERS (THERMOSYPHON) TYPE	5	D-1	DECANTER	6	AC-1	ACCUMULATOR	
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	b	<p>Utility Block Diagram for steam</p> <pre>graph LR BH[BOILER HOUSE] --> R1[REACTOR - 1] BH --> H1[HEATER - 1] BH --> RB1[REBOILER - 1] BH --> RB2[REBOILER - 2] R1 --> CH[CONDENSATE HEADER] H1 --> CH RB1 --> CH RB2 --> CH CH --> BH</pre>	04																					
6	a	<p>Equipment Layout</p> <table><tr><th>NO.</th><th>CODE</th><th>DESCRIPTION</th></tr><tr><td>1</td><td>ADC-1</td><td>AZEOTROPIC DISTILLATION COLUMN</td></tr><tr><td>2</td><td>RC-1</td><td>RECOVERY COLUMN</td></tr><tr><td>3</td><td>C-1, C-2</td><td>CONDENSERS</td></tr><tr><td>4</td><td>RB-1,2</td><td>REBOILERS (THERMOSYPHON) TYPE</td></tr><tr><td>5</td><td>D-1</td><td>DECANTER</td></tr><tr><td>6</td><td>AC-1</td><td>ACCUMULATOR</td></tr></table>	NO.	CODE	DESCRIPTION	1	ADC-1	AZEOTROPIC DISTILLATION COLUMN	2	RC-1	RECOVERY COLUMN	3	C-1, C-2	CONDENSERS	4	RB-1,2	REBOILERS (THERMOSYPHON) TYPE	5	D-1	DECANTER	6	AC-1	ACCUMULATOR	8 marks equipment layout + 2 marks legend
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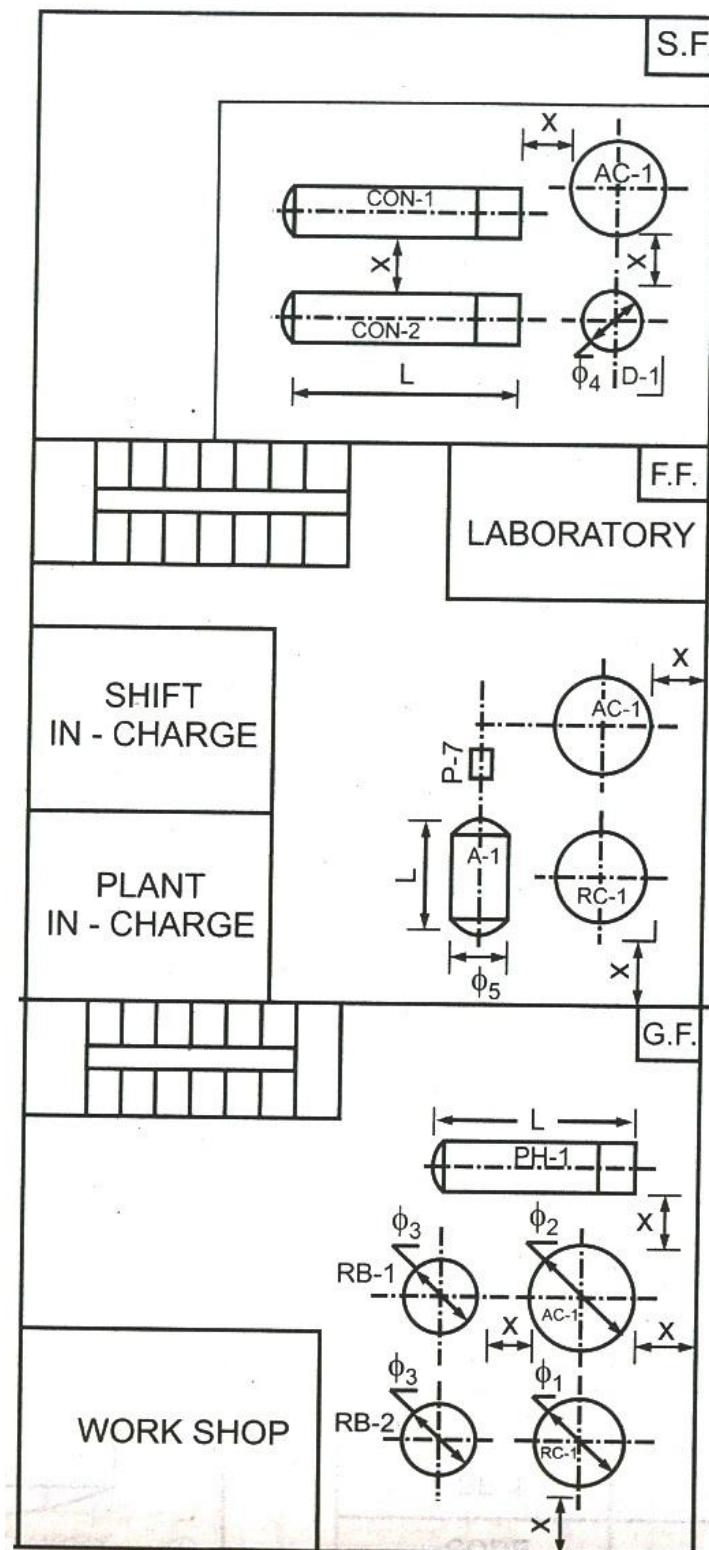
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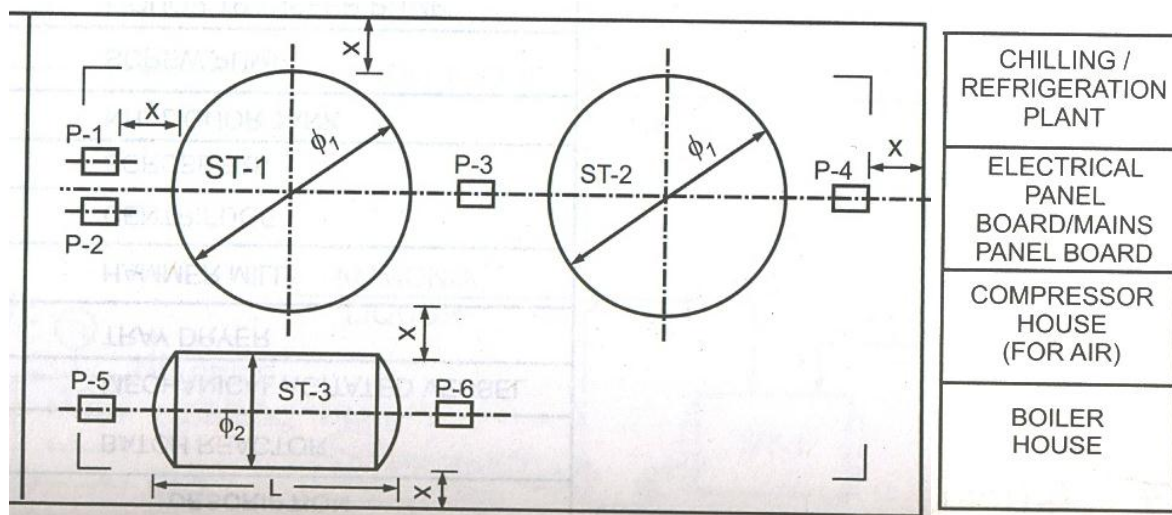
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b Tank Farm cum Utility Block Diagram



ST1 – 96% alcohol storage tank

ST-2 – Absolute alcohol storage tank

ST-3 – Benzene storage tank

3 marks
tank farm
+2 marks
UBD +1
marks
legend