



SUMMER-2017 EXAMINATION
Model Answer

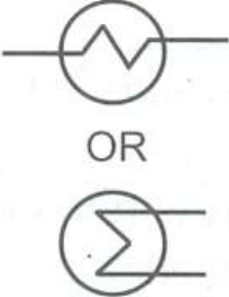
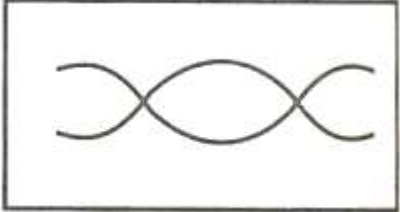
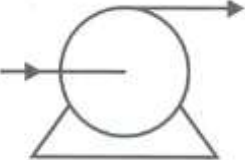
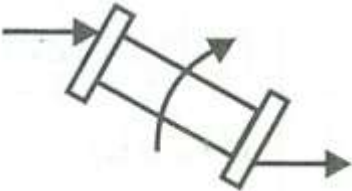
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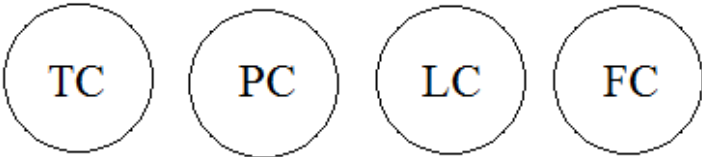
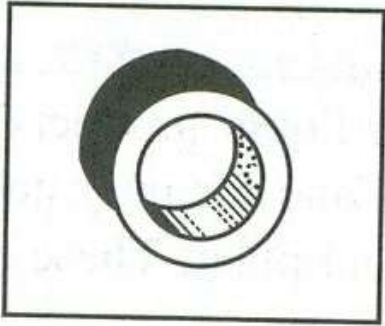
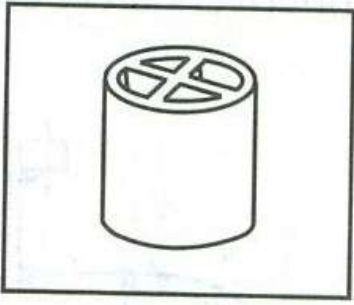
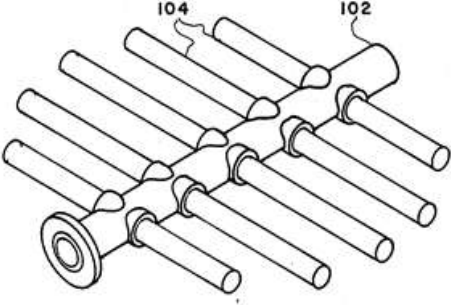
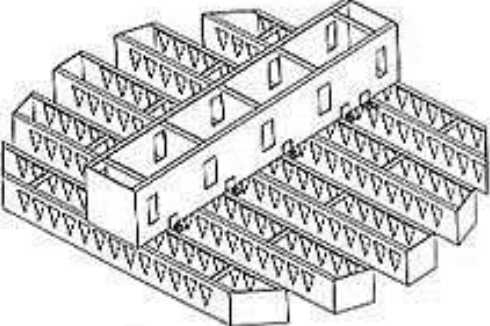
Important Instructions to examiners:

- 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.	Answer	Marks
1 (A)	Attempt any three	
a)	<p>Heat Exchanger</p>  <p>OR</p> <p>Mixing</p>  <p>Centrifugal Pump</p>  <p>Rotary dryer (Marks can be given for rotary dryer or rotary vacuum filter)</p>  <p>Any other symbol which shows heat exchange should be considered.</p>	1 Mark for each



b)	<p>Instrumentation symbols for Temp, Press, Level and Flow controller</p> <p style="text-align: center;"></p>	1 mark for each
c)	<p>Raschig ring and cross partition ring (marks should be given for other packing also)</p> <p style="text-align: center;"> Raschig Ring</p> <p style="text-align: center;"> Cross partition Ring</p> <p>Liquid distributor</p> <p style="text-align: center;"></p> <p style="text-align: center;"></p>	2+2



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d)	<p>Socket and Nipple joint</p>	2+2																																																												
(B)	Attempt any one																																																													
a)	<p>Specification sheet of batch reactor</p> <table border="1" data-bbox="256 945 1258 1680"> <thead> <tr> <th colspan="3">3 SPECIFICATION SHEET FOR BATCH REACTOR (JACKETED)</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Specification No.</td> <td>Date</td> </tr> <tr> <td>2.</td> <td>Number required</td> <td>Location</td> </tr> <tr> <td>3.</td> <td>Capacity (volumetric)</td> <td></td> </tr> <tr> <td>4.</td> <td>Operating conditions</td> <td></td> </tr> <tr> <td>5.</td> <td>Process materials handled</td> <td></td> </tr> <tr> <td>6.</td> <td>Feed composition</td> <td>density viscosity</td> </tr> <tr> <td>7.</td> <td>Product mix. composition</td> <td>density viscosity</td> </tr> <tr> <td>8.</td> <td>Temperature</td> <td>Pressure</td> </tr> <tr> <td>9.</td> <td>Construction details</td> <td></td> </tr> <tr> <td>10.</td> <td>Reactor shell : dia.</td> <td>height thickness</td> </tr> <tr> <td>11.</td> <td>Heads type</td> <td></td> </tr> <tr> <td>12.</td> <td>Jacket heating surface</td> <td>Pressure on Jacket side</td> </tr> <tr> <td>13.</td> <td>Jacket : type</td> <td></td> </tr> <tr> <td>14.</td> <td>Jacket : length</td> <td>dia. thickness</td> </tr> <tr> <td>15.</td> <td>Vessel connections :</td> <td></td> </tr> <tr> <td>16.</td> <td>Inlet : No. size</td> <td>Outlet : No. size</td> </tr> <tr> <td>17.</td> <td>Manhole size</td> <td>Stuffing box opening</td> </tr> <tr> <td>18.</td> <td>Pressure gauge connection</td> <td>Thermowell pocket</td> </tr> <tr> <td>19.</td> <td>Jacket connections :</td> <td></td> </tr> </tbody> </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 :		8
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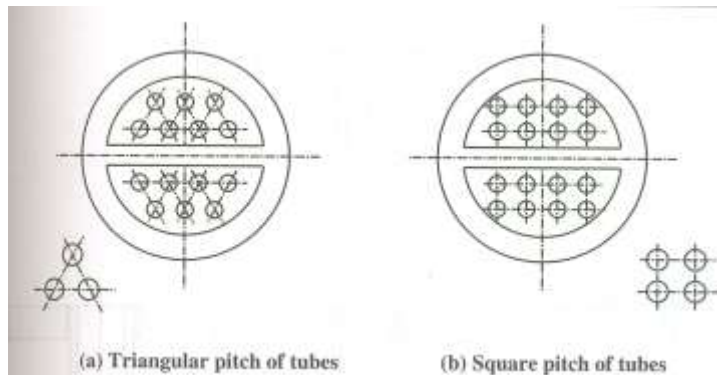
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20.	Steam inlet condensate size
21.	Water inlet water outlet jacket drain
22.	Agitator type Agitator/impeller dia.
23.	Speed
24.	Shaft : dia. length
25.	Blades : No. width breadth thickness
26.	Baffles : No. length width
27.	Stuffing box : Make type 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)

Tube sheet



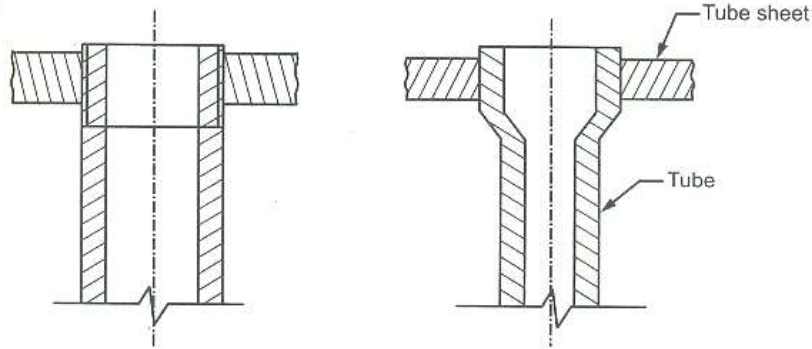
Fixing tubes on tube sheet

4+4



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OR

b) Shell and tube heat exchanger (1-1)

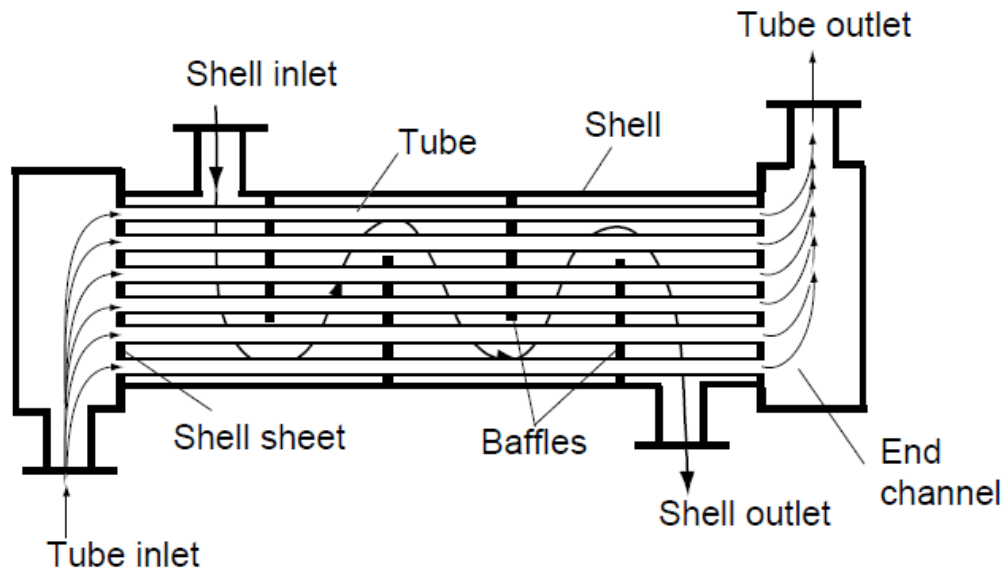


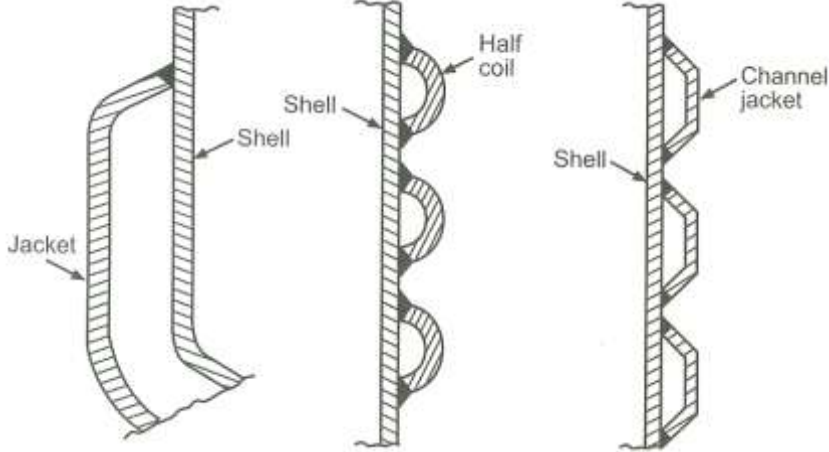
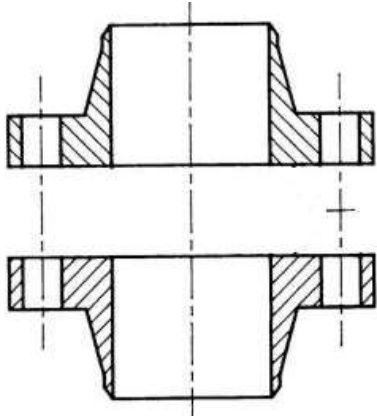
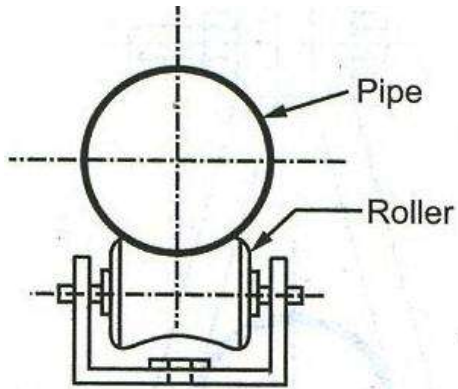
Diagram
5 marks,
nomenclature
3marks

2 Attempt any four

a) Jackets

4 marks
for any
one



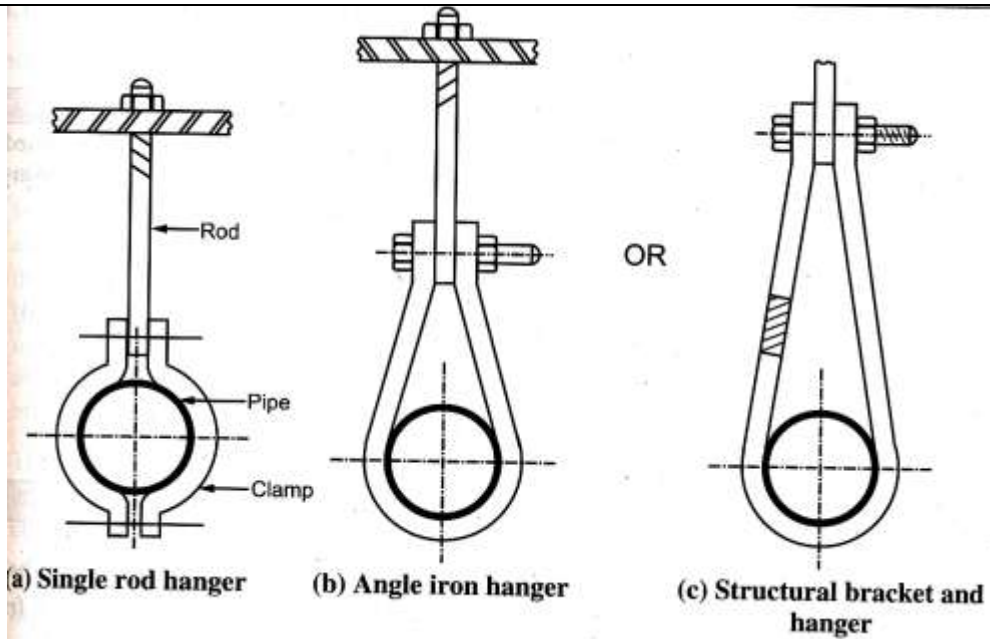
	 <p>The diagram shows three cross-sectional views of heat exchanger jackets. The first is a simple U-shaped jacket labeled 'Jacket'. The second is a shell with a helical coil inside, labeled 'Shell' and 'Half coil'. The third is a shell with a zig-zag channel jacket inside, labeled 'Shell' and 'Channel jacket'.</p>	
b)	<p>Plain Face Flange</p>  <p>The diagram shows a cross-section of a plain face flange, consisting of two flange halves with a flat, parallel mating surface. The flange has a raised face and a gasket groove.</p>	4
c)	<p>Support for steam pipes</p>  <p>The diagram shows a cross-section of a pipe support. A circular pipe is supported by a U-shaped hanger. The hanger is supported by a base with rollers. Labels include 'Pipe' and 'Roller'.</p>	2 marks each for any two



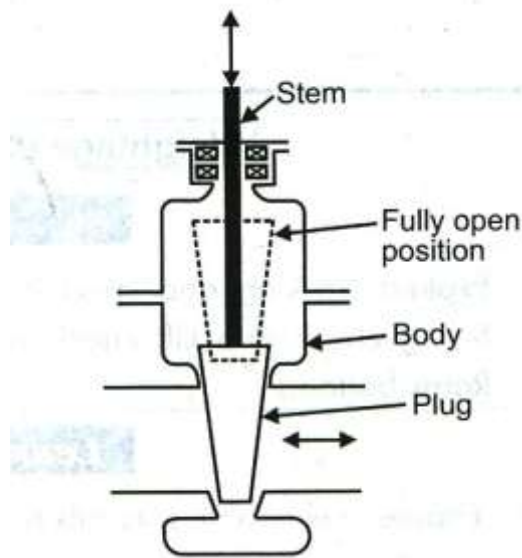
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d) Gate valve

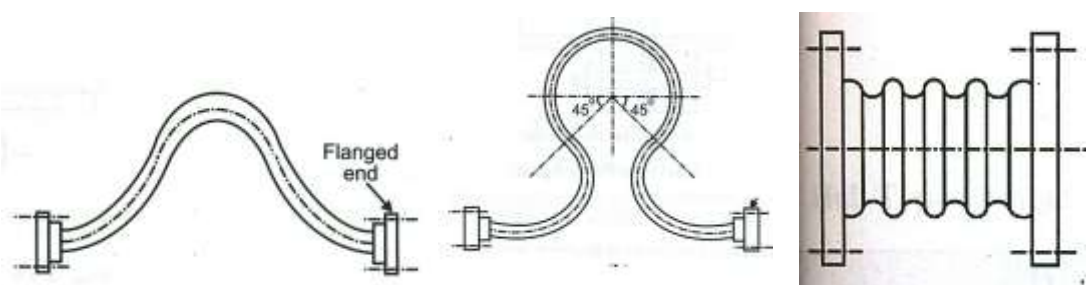
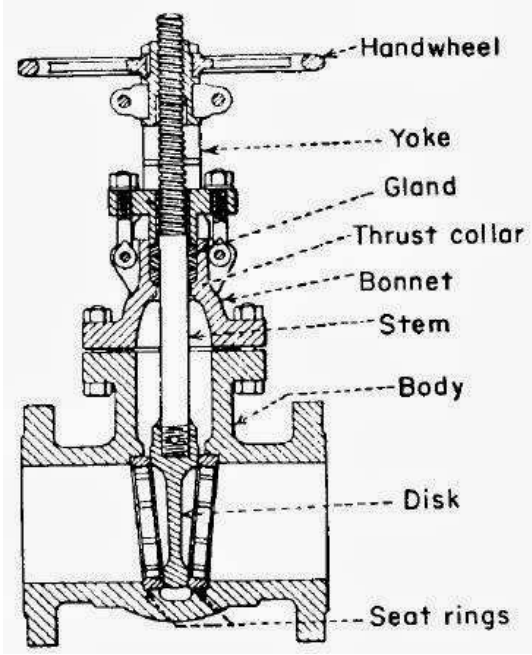




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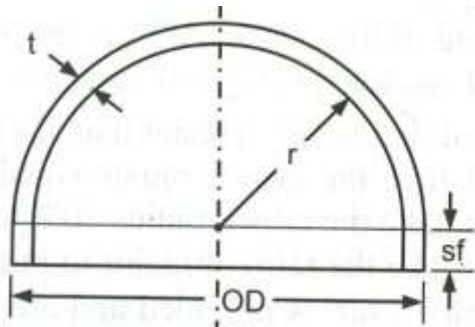
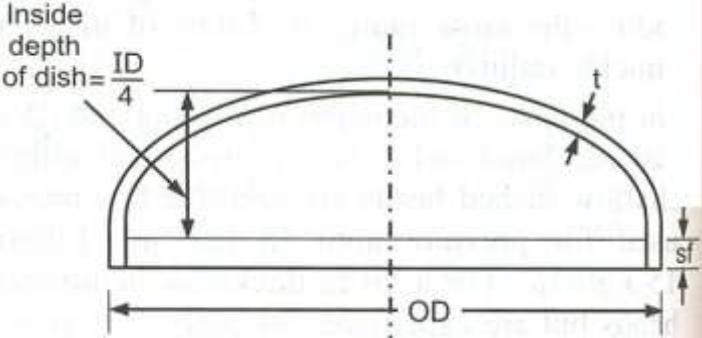
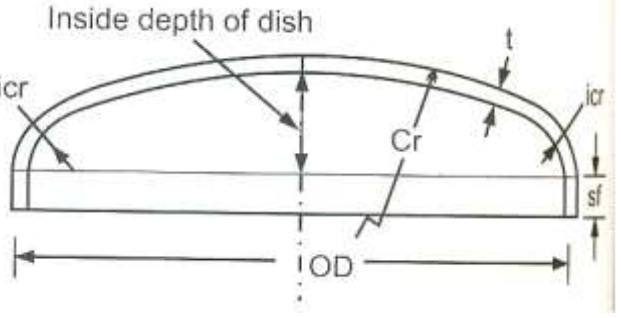
e)	<p>Expansion Joint</p>  <p>The diagrams illustrate three types of expansion joints. The first is a wavy joint with a 'Flanged end' label. The second is a looped joint with two 45-degree angles indicated. The third is a corrugated joint.</p>	2 marks each for any two
f)	<p>Gate Valve sectional view</p>  <p>The sectional view of a gate valve shows the following components: Handwheel, Yoke, Gland, Thrust collar, Bonnet, Stem, Body, Disk, and Seat rings.</p>	4



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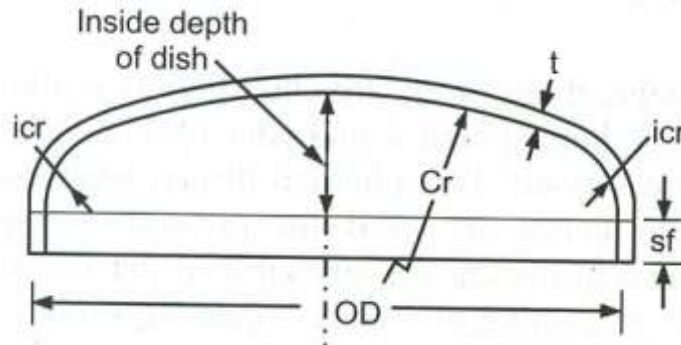
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3	Attempt any four	
a)	<p>Hemispherical Head</p>  <p>Elliptical dished head</p>  <p>Flanged and Standard dished head</p> 	2 marks each for any two



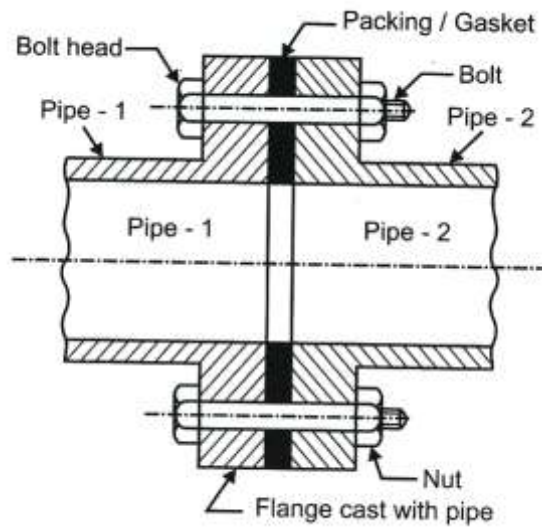
Torispherical Dished head



b) **Screwed joint**

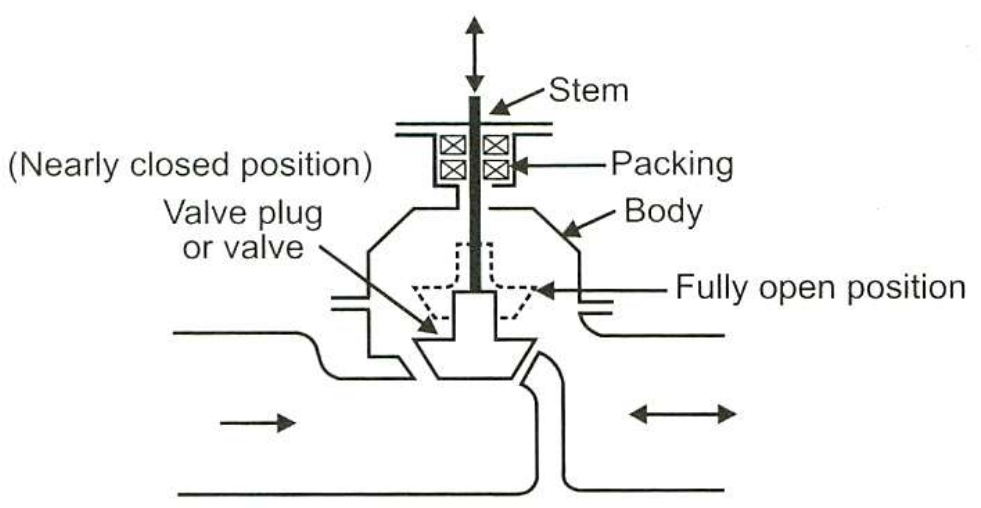
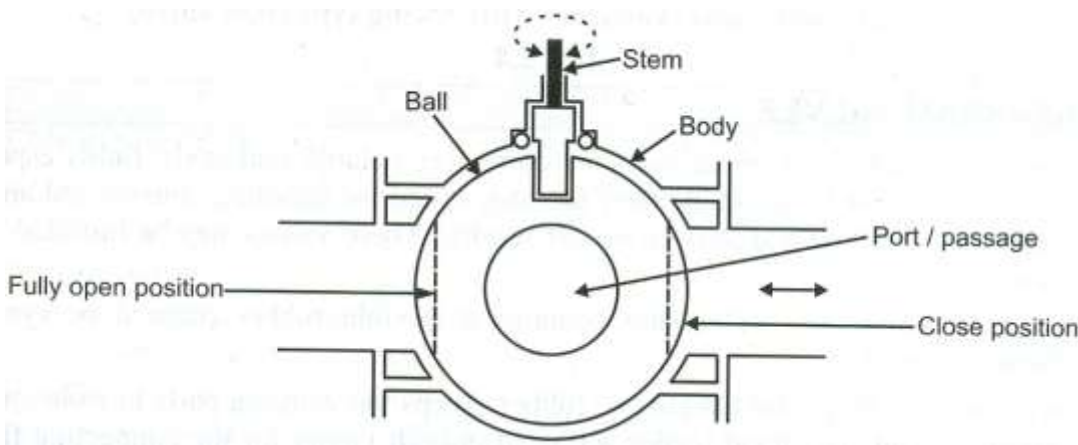


Flanged joint



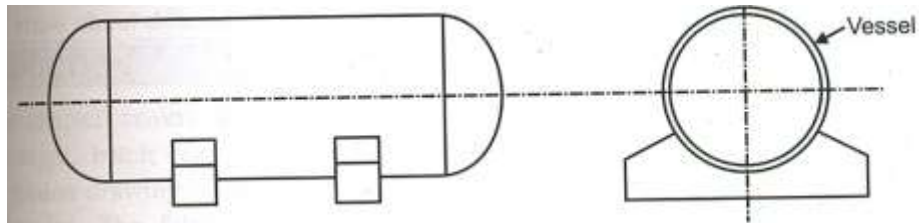
2+2



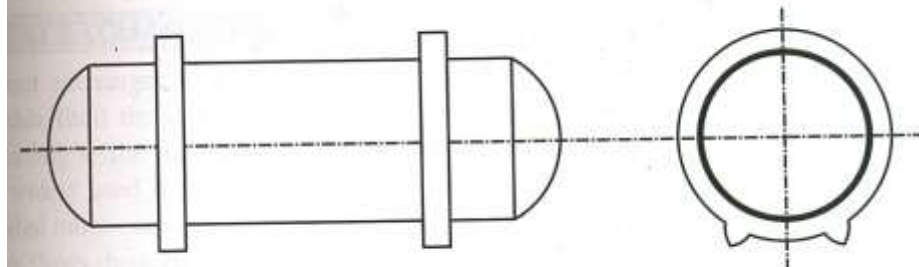
c)	<p>Globe Valve</p>  <p>(Nearly closed position)</p> <p>Stem</p> <p>Packing</p> <p>Body</p> <p>Valve plug or valve</p> <p>Fully open position</p>	4
d)	<p>Ball valve</p>  <p>Stem</p> <p>Ball</p> <p>Body</p> <p>Port / passage</p> <p>Fully open position</p> <p>Close position</p>	4



e) **Saddle support**

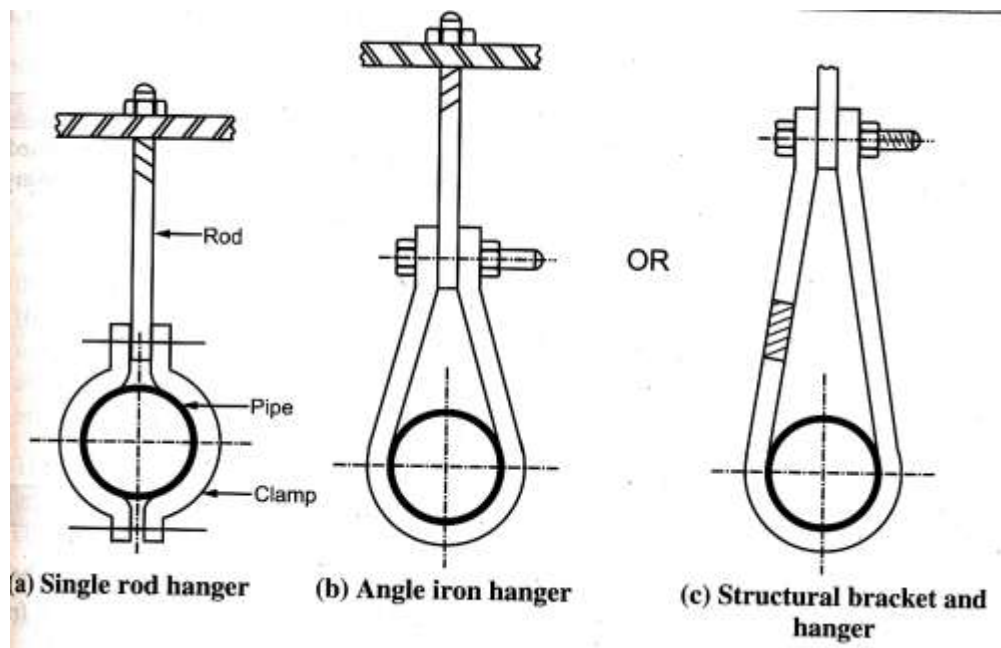


(a) Saddle support (Plate type)



(b) Saddle support (Ring type)

Hanger support



2+2



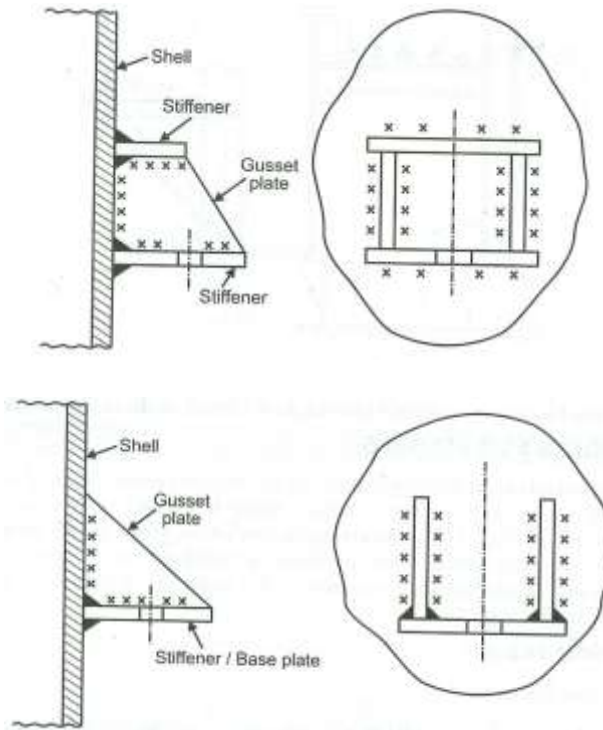
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f)

Bracket support



4

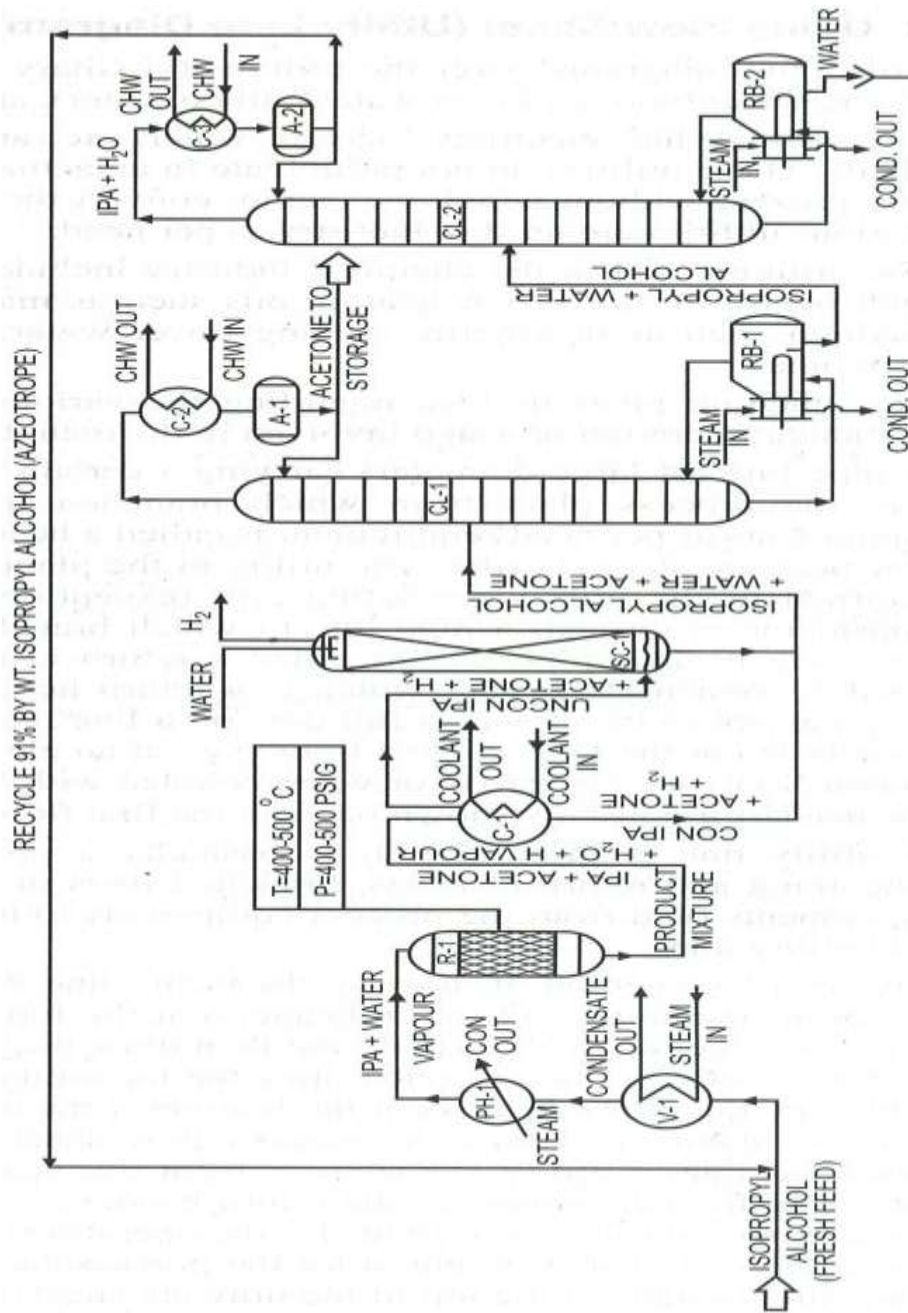
4

Process Flow Diagram

Legend for Q 4 , 5 and 6

CODE	DESCRIPTION
V-1	VAPORISER
PH-1	PREHEATER
R-1	CATALYTIC REACTOR
C-1,2,3	CONDENSERS
CL-1,2	DISTILLATION COLUMNS
RB-1,2	REBOILERS
SC-1	SCRUBBER
A-1,2	ACCUMULATORS
CHW	CHILLED WATER

PFD 12
marks +
legend 4
marks





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5	For Process in Q.4	
a)	<p>Utility Line Diagram</p> <p>Medium Pressure Steam Header MPS Condensing Return Water CRW Cooling Water In Header CWI Cooling Water Out Header CWO</p> <p>IPA TPA + H₂O Product Separator IPA C-1 C-2 C-3 A-1 A-2 E-1 E-2 P-1 P-2 V-1 V-2 V-3 V-4 V-5 V-6 V-7 V-8 V-9 V-10 V-11 V-12 V-13 V-14 V-15 V-16 V-17 V-18 V-19 V-20 V-21 V-22 V-23 V-24 V-25 V-26 V-27 V-28 V-29 V-30 V-31 V-32 V-33 V-34 V-35 V-36 V-37 V-38 V-39 V-40 V-41 V-42 V-43 V-44 V-45 V-46 V-47 V-48 V-49 V-50 V-51 V-52 V-53 V-54 V-55 V-56 V-57 V-58 V-59 V-60 V-61 V-62 V-63 V-64 V-65 V-66 V-67 V-68 V-69 V-70 V-71 V-72 V-73 V-74 V-75 V-76 V-77 V-78 V-79 V-80 V-81 V-82 V-83 V-84 V-85 V-86 V-87 V-88 V-89 V-90 V-91 V-92 V-93 V-94 V-95 V-96 V-97 V-98 V-99 V-100</p>	ULD 7 marks + legends 1 mark



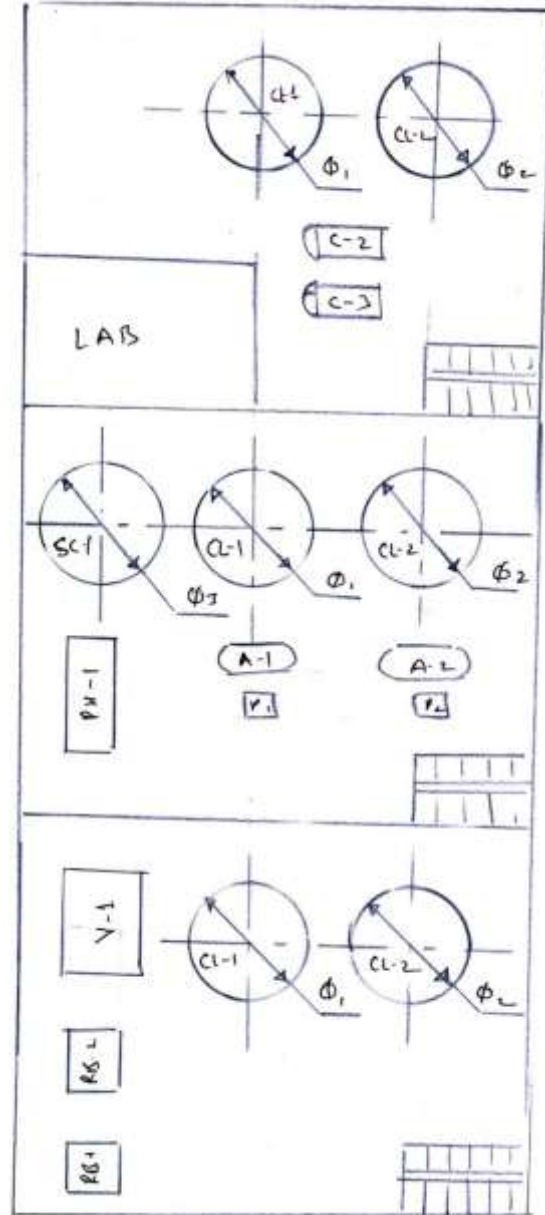
b)	<p>Fractionating column control is divided into two part 1) Top Control 2) Bottom Control</p>	8
6	For Process in Q.4	
a)	Equipment layout	Equipm ent layout 7 marks + legends 1 mark



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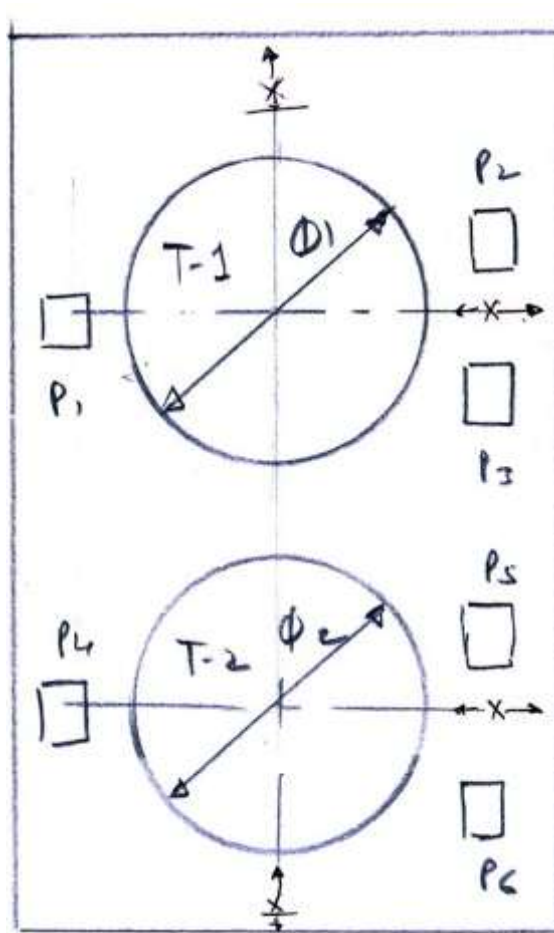


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b) Tank farm and utility block diagram



T-1 - IPA storage tank

T-2 Acetone storage tank

P-1,2,3- IPA transfer pumps

P-3,4,5 - Acetone transfer pumps

6

2