17647

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4 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. (A) Attempt any THREE : **12**

(a) Draw neat and proportionate symbols of Bag filter, kettle type reboiler.

(b) Draw neat symbols of Autoclave, Burner.

(c) Draw free sketch of any two packings use in packed towers.

(d) Draw neat sectional views of socket and spigot joint.

(B) Attempt any ONE : **8**

(a) Draw specification sheet for a Shell and Tube Heat Exchanger.

(b) Draw a neat proportionate drawing of distillation column and its nomenclature.

2. Attempt any FOUR: **16**

(a) Draw any two types of jackets used for pressure vessels.

(b) Draw a neat proportionate sketches of screwed flange type.

(c) Show by neat proportionate sketches of Bracket support for vertical vessels.

(d) Draw a neat proportionate sketch of saddle support.

(e) Show by neat proportionate sectional drawing of globe valve with nomenclature.

(f) Draw a neat proportionate sketches of a Hydraulic Joint.

3. Attempt any FOUR: **16**

(a) Draw a neat proportionate drawing of any two types of heads. Indicate dimensions on them.

(b) Draw a neat proportionate sketches of corrugated joint.

(c) Show by neat proportionate free hand sketch of any two types of steam pipe supports.

(d) Show by neat proportionate free hand sketch of a Diaphragm valve.

(e) Draw a neat sketch of a Ball valve.

(f) Draw a neat sketch of a spring loaded safety valve.

4. Read the process and attempt the following : **16**

Formaldehyde is produced by oxydehydrogenation of methanol. The air is heated in the air preheater and methanol is vaporised in the vaporiser. Then, they are mixed in the desired proportion and are introduced into the fixed bed reactor. The reaction occuring in the bed are :

$CH_3OH \rightarrow HCHO + H_2$

$CH_3OH + ½\ O_2 \rightarrow HCHO + H_2O$

The product gases containing formaldehyde, hydrogen, water, methanol, O_2 and N_2 are cooled in the heat exchanger using suitable cooling media. The exothermicity associated with reaction is removed by passing compressed water on shell side of fixed bed reactor and utilised for producing low pressure steam. The cooled product gases are then introduced to the battery of scrubbers/absorbers in which formaldehyde and methanol are absorbed in water. The liquid mixture leaving absorber containing formaldehyde, methanol and water is sent to the intermediate storage tank. The crude formaldehyde solution from intermediate storage tank is then fed to the distillation column from the top of which methanol is obtained and is recycled to vaporiser and formaldehyde in the form of formalin (37% formaldehyde solution) is removed as bottom product.

Draw a neat, detailed process flow diagram with legend for the above process.

5. Answer the following : **16**

(a) Draw utility line diagram with legend for the process given in Q. no. 4.

(b) Draw the piping and instrumentation diagram of a continuous distillation column with reflux and reboiler.

6. Answer the following : **16**

(a) Draw the equipment layout diagram for the process description given in Q. No. 4.

(b) Draw the Tank farm diagram for the process description given in Q. No. 4.
