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[5151]-110

F.E. EXAMINATION, 2017

BASIC MECHANICAL ENGINEERING

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Assume suitable data, if necessary.

(ii) Figures to the right indicate full marks.

(iii) Neat diagrams must be drawn wherever necessary.

(iv) Use of non-programmable electronic calculator is permitted.

(v) Attempt *four* questions out of eight Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

1. (a) Draw neat diagrams of : [6]

(i) Ball bearing and

(ii) Disc brake.

(b) Define the following mechanical properties of material : [6]

Strength, Toughness, Hardness, Creep, Plasticity and Elasticity.

P.T.O.

Or

2. (a) Draw sketches of V belt drive, chain drive and spur gear drive. [6]
- (b) Compare mechanism and machine (four points). Draw a schematic sketch of reciprocating compressor. [6]
3. (a) What is sand casting process ? Draw neat sketch of sand casting process setup and explain steps involved in the process. [7]
- (b) Draw a block diagram of a radial drilling machine and explain tapping operation with sketch. [6]
4. (a) Draw neat sketch of soldering process setup. Explain the process in brief. State application of the process. [6]
- (b) Draw a block diagram of lathe machine. Explain function of headstock, tailstock and carriage. [7]
5. (a) State any two statements and limitations of first law of thermodynamics. [4]
- (b) Draw schematic sketches of : [4]
- (i) Barometer
 - (ii) U-Tube Manometer
 - (iii) Thermocouple
 - (iv) Isolated system.

- (c) A fish freezing plant is to be maintained at -10 degree C. If power required to drive the plant is 30 kW and COP of refrigeration system is 3. Find : [5]
- (i) heat sucked (absorbed) from the freezing plant and
(ii) heat rejected to the surrounding.
- Draw sketch of the system.

Or

6. (a) Explain the following : [4]
- (i) System, surrounding and boundary
(ii) Kelvin Plank's statement of second law of thermodynamics.
- (b) Draw sketches of heat pump and refrigerator system. Derive the relation between COP of Heat Pump and COP of Refrigerator. [4]
- (c) The pressure of kerosene flowing through a pipe is to be measured with simple U-tube mercury manometer. Left arm of U-tube is connected to pipe while right arm of the U-tube is open to atmosphere.
- Calculate the absolute pressure of the kerosene in pipeline and mercury level in right-arm above datum when kerosene level in left arm is 60 cm above datum. Draw the sketch of the setup.

Given :

Atmospheric Pressure = 10 m of water column

Gauge Pressure of kerosene = 22 kPa

Acceleration due to gravity, $g = 9.81 \text{ m/s}^2$

Specific gravity of the kerosene = 0.8

Density of mercury = 13600 kg/m^3 . [5]

7. (a) Draw a sketch of wind power plant. Explain energy transfer (extraction) in the power plant and state its limitations. [6]
- (b) Draw neat sketch of four stroke cycle spark ignition engine. Compare two stroke and four stroke cycle engines. (Four Imp Points). [6]

Or

8. (a) Draw a sketch of hydro-electric power plant. Explain energy transfer (extraction) in the power plant and state its limitations. [6]
- (b) Explain construction and working of centrifugal pump. [6]