

Mech  
AUTO

Sub:- FM

Date: 27/5/14

QP Code : MV-18476

(3 Hours)

[Total Marks : 100

- N. B. :**
1. Question no.1 is compulsory.
  2. Attempt any **FOUR** from question no. 2 to 7.
  3. Use illustrative diagrams wherever required.

- Q1) a) What do you mean by boundary layer and boundary layer thickness? 05  
 b) What is pitot tube? On what principle does it work? 05  
 c) Two horizontal plates are placed 1.25 cm apart, the space between them being 05  
 filled with oil of viscosity 14 poise. Calculate the shear stress in oil if upper plate  
 is moved with a velocity of 2.5 m/s  
 d) The barometric pressure at sea level is 760 mm of mercury while that on a 05  
 mountain top is 725 mm, if the density of air is assumed constant at 1.19 kg/m<sup>3</sup>,  
 what is the elevation of the mountain top.
- Q2) a) A sliding gate 3m wide and 1.5m high situated in a vertical plane has a 10  
 coefficient of friction between itself and guide of 0.18. If the gate weight is  
 19 kN and if its upper edge is at a depth of 9 m, what vertical force is required to  
 raise it? Neglect buoyancy force on gate  
 b) Using the laminar boundary layer velocity distribution: 10

$$\frac{u}{U} = 2 \left( \frac{Y}{\delta} \right) - \left( \frac{Y}{\delta} \right)^2$$

- i) Check if boundary layer separation occurs.
- ii) Determine Boundary layer thickness (In terms of Re)

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- Q3) a) Derive Euler's equation for three dimensions. 12  
 b) An oil of specific gravity 0.8 flows upwards through a vertical pipe. A & B are two points in the pipe, B being 30 cm higher than A. Connections are led from A & B to a U-tube containing mercury. If the difference of pressure between A & B is  $0.18 \text{ kg/cm}^2$ . Find the reading shown by the differential manometer. 08
- Q4) a) Starting from Navier Stokes equation for incompressible laminar flows derive an equation for velocity profile for Couette flow. State the assumptions made. 10  
 b) Derive Darcy-weisbach equation and state its utility. 10
- Q5) a) Explain Reynold's transport theorem with its proof. 10  
 b) A liquid of viscosity of 0.88 poise is filled between two horizontal plates 10 mm apart. If the upper plate moving at 1.1 m/s with respect to lower plate is stationary and pressure difference between the two sections 60 m apart is  $60 \text{ KN/m}^2$ , determine:  
 i) Velocity distribution  
 ii) Discharge per unit width, and  
 iii) Shear stress on the upper plate. 10
- Q6) a) Three pipes of diameters 300 mm, 200 mm & 400 mm and lengths 450 m, 255 m & 315m respectively are connected in series. The difference in water surface levels in two tanks is 18 m. Determine the rate of flow of water if coefficients of friction are 0.0075, 0.0078 & 0.0072 respectively (consider minor losses). 10  
 b) A uniform flow of velocity 6 m/s is flowing along x axis over a source & sink which are situated along x axis. The strength of source and sink is  $15 \text{ m}^2/\text{s}$  and they are at a distance of 1.5 m apart. Determine  
 i) Location of stagnation points  
 ii) Length & width of the Rankine oval  
 iii) Equation of profile of the Rankine body. 10
- Q7) a) Distinguish between (any three)  
 i) Streamlined and Bluff bodies  
 ii) Implicit and Explicit schemes  
 iii) Structured and Unstructured grid  
 iv) Finite Volume Method and Finite Difference Method. 12  
 b) Write short note on the following  
 i) Elbow Meter  
 ii) Moody's Diagram. 08

AUTO

Sub: - VS

Date: - 2/6/14

QP Code : MV-18538

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions from **remaining** questions.  
(3) Draw **suitable** sketches wherever **necessary**.  
(4) Figures to the **right** indicate **full** marks.

1. Sketch and explain the following :— 20
  - (a) Torque Converter
  - (b) Power steering.
  
2. (a) Explain the various components of clutch assembly used in heavy duty vehicles with neat sketches. 10  
(b) Describe synchromesh gear-box operation in detail with proper diagrams. 10
  
3. (a) With proper diagrams explain the functioning of differential with different gears. 10  
(b) Discuss the Automatic transmission system with suitable diagram. 10
  
4. (a) Describe the comparison of Drum-brake and Disc-brake with proper diagrams. 10  
(b) Define & Explain the terms related to steering geometry. 10
  
5. (a) Enlist the types of suspension-systems. Sketch and explain any two of them. 10  
(b) With suitable sketch describe the types of tyres. State the advantages of tubeless tyre. 10
  
6. (a) Sketch and explain purpose and function of an overdrive and constant velocity joints. 10  
(b) What are the advantages and disadvantages of air-brakes over hydraulic brakes. Draw the block diagram of both the brakes. 10
  
7. Write short notes on any **four** :— 20
  - (a) Brake lining materials
  - (b) Propeller shaft construction
  - (c) Recirculating ball type steering gear
  - (d) Fluid flywheel
  - (e) Wheel alignment.

TE SEM-VI (REV) May-June-14  
OTR

Mech  
AUTO

Sub: HMT

Date: 6/6/14

QP Code : MV-18557

(3 Hours)

[Total Marks : 100

- N.B. 1. Question no. 1 is compulsory.  
2. Answer any four from the remaining six questions.  
3. Assume suitable data wherever necessary.  
4. Figure to the right indicates full marks.



Q.1. Answer any four of the following.

20

- Fouling in heat exchanger.
- Thermal boundary layer
- Shape factor and its properties
- Mass transfer dimensional numbers
- What is a black body? How does it differ from a gray body?

Q.2 (a) Water ( $C_{pc}=4200 \text{ J/kg } ^\circ\text{C}$ ) enters a counter flow double pipe heat exchanger at  $38^\circ\text{C}$  flowing at  $0.076 \text{ kg/s}$ . It is heated by oil ( $c_p=1880 \text{ J/kg } ^\circ\text{C}$ ) flowing at the rate of  $0.152 \text{ kg/s}$  from an inlet temperature of  $116^\circ\text{C}$ . For an area of  $1 \text{ m}^2$  and  $U=340 \text{ W/m}^2 ^\circ\text{C}$ , Determine the total heat transfer rate.

10

(b) Explain  $\pi$  theorem for dimensional analysis.

06

(c) Differentiate between free and forced convection

04

Q.3 (a) Air at  $20^\circ\text{C}$  is flowing over a flat plate which is  $20 \text{ cm}$  wide and  $50 \text{ cm}$  long. The plate is maintained at  $100^\circ\text{C}$ . Find heat loss from the plate if air is flowing parallel to  $50 \text{ cm}$  side with a velocity of  $2 \text{ m/s}$ . What will be the effect on heat transfer if the flow is parallel to  $20 \text{ cm}$  side? Take the following properties of air at  $60^\circ\text{C}$ ,  $\nu=18.97 \times 10^{-6} \text{ m}^2/\text{s}$ ,  $k=0.029 \text{ W/m } ^\circ\text{C}$  and  $Pr=0.7$ . Use  $Nu_x=0.664(Re_x)^{0.5}(Pr_x)^{0.33}$

12

(b) The net radiation from the surface of two parallel plates maintained at temp.  $T_1$  &  $T_2$  is to be reduced by  $99\%$ . Calculate the numbers of screens to be placed between the two

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Con. 13160-14.

surfaces to achieve this reduction in heat exchange. Assuming the emissivity of screens as 0.04 and that of surfaces as 0.7. 08

Q.4 (a) The composite wall of a furnace is made up with 120 mm of fire clay [ $k=0.25(1+0.0009 t) \text{ W/m}^0\text{C}$ ] and 600 mm of red brick ( $k=0.8 \text{ W/m}^0\text{C}$ ). The inside surface temperature is  $1250^0\text{C}$  and the outside temperature is  $40^0\text{C}$ . Determine :

(i) The temperature at the layer interface and  
(ii) the heat loss for  $1 \text{ m}^2$  of surface wall. 10

(b) Derive expression for LMTD for counter flow type heat exchanger. 06

(c) Find the shape factor of a hemispherical hole of diameter 10 cm w.r.t. itself. 04

Q.5 (a) For transient heat conduction, with negligible internal resistance with usual notations show that,

$$\theta/\theta_i = \exp(-Bi.Fo) \quad 10$$

(b) Develop an expression for the efficiency of a fin of uniform cross section when heat loss from the fin tip is considered negligible. 06

(c) Explain Heisler charts. 04

Q.6 (a) Two long rods of same diameter, one made up of brass ( $k=85 \text{ W/m}^0\text{C}$ ) and other made of copper ( $k=375 \text{ W/m}^0\text{C}$ ) have one of their ends inserted into the furnace. Both of the rods are exposed to the same environment. At a distance 105 mm away from the furnace end, the temperature of the brass rod is  $120^0\text{C}$ . At what distance from the furnace end the same temperature would be reached in the copper rod? 10

(b) Explain Nusselt theory of film condensation. 06

(c) Classify heat exchangers on various arrangements. 04

Q.7 (a) A steel ball 50 mm in diameter and  $900^0\text{C}$  is placed in still atmosphere of  $30^0\text{C}$ . Calculate the initial rate of cooling of the ball in  $^0\text{C}/\text{min}$ .

Take:  $\rho=7800 \text{ kJ/kg}^0\text{C}$  (for steel);  $h=30 \text{ W/m}^2\text{C}$ .

Neglect internal thermal resistance 10

(b) Explain velocity and thermal boundary layer thickness. 06

(c) Explain film and drop wise condensation. 04

EVS - ~~COMPO~~ EXT

mech

EVS - Sem V (REV)

Date - 12.06.14

Mech  
AUTO

QP Code : MV-18597

(2 Hours)

[ Total Marks : 50

- N. B. : (1) Question No. 1 is **compulsory**.  
(2) Attempt any **four** questions from question No. 2 to 7.  
(3) **Figures** to the **right** indicate **full** marks.  
(4) Draw suitable diagrams wherever required.

1. Attempt any **five** of the following :- 10
- (a) With suitable example, explain the energy flow in any ecosystem.
  - (b) How Ex-situ conservation of biodiversity is carried out?
  - (c) Why value education is important for better environment?
  - (d) Explain the causes and effects of thermal pollution.
  - (e) Why wasteland management is important?
  - (f) What are the limitations of conventional sources of energy?
  - (g) Explain the term 'sustainable development.'
2. (a) What are our forest resources? Explain the reasons for depletion of forest resources? 5
- (b) What is population explosion? What are the effects of growing population on environment? 5
3. (a) Explain briefly characteristic features and functions of grassland ecosystem. 5
- (b) What are the causes and effects of global warming? 5
4. (a) Why conservation of water is important? Explain briefly how watershed management is carried out? 5
- (b) What are the problems of women and children in India? What is being done for their welfare? 5
5. (a) What role an individual can play in preventing the pollution? 5
- (b) What are the causes and effects of water pollution? 5
6. (a) Explain the salient features of water pollution prevention act. 5
- (b) List any four important air pollutants. Explain the effects caused on account of them. 5
7. (a) How solid waste management is done? 5
- (b) What role is played by Information Technology to the field of Health and Environment? 5