Mech / Auto / TOM II / Sem / CBGS / Sem V / May 2017

17/05/17.

Q. P. Code : 600500

(3 Hours) [Total Marks : 80]

N.B. 1) Question No. 1 is compulsory

2) Answer any Three questions from remaining Five

3) Assume sutaible data wherever required, justify the same

4) Answer to questions showed be grouped and written together.

Qu. 1 Solve any Four (20)

a) What is the condition for self locking and self energizing of the belt?
b) Where and for what purpose a clutch is used? What are the different types of clutches? Explain the working of any one type of clutch.
c) Explain epicyclic gear train.
d) Define dynamically equivalent systems. State the condition necessary to make two systems dynamically equivalent.
e) Describe the gyroscopic effect on sea going vessels.
f) What is the function of governor? Classify governor.

Qu. 2 a) If capacity of a single plate clutch decreases by 13% during the initial wear period. determine the minimum value of ratio of internal diameter to external diameter for the same axial load. Consider both the sides of the clutch plate to be effective. (10)

b) The upper arm of porter governor are pivoted on the axis of rotation, their lengths being 30cm. the lower arms are pivoted on the sleeve at a distance 3 cm from the axis, their lengths being 27cm. Mass of each ball is 6 kg and the sleeve mass is 50 kg. Determine the equilibrium speed for a radius of rotation of 17 cm and also the effort and power for 1% change of speed. (10)

Qu. 3 a). A vehicle moves on a road that has a slope of 15^0. The wheel base and the Centre of mass at 0.72 m from the rare wheels and 0.8m above the inclined plane. The speed of the vehicle is 45 km/hr. the brakes are applied to all the four wheels and the coefficient of friction is 0.4. Determine the distance moved by the vehicle before coming to rest and the time taken to do so if it moves (i) up the plane (ii) down the plane. (10)

b) In a Hartnell governor, the radius of rotation of the balls is 60mm at the minimum speed of 240rpm. The length of the ball arm is 130mm and of the sleeve arm 80mm. the mass of each ball is 3kg and of the sleeve 4 kg. The stiffness of the spring is 20 N/mm. Determine (i) The speed when the sleeve is lifted by 50 mm. (ii) the initial compression of the spring. (iii) The governor effort. (iv) The power. (10)

[TURN OVER]

DF85B2CAF8DDC703193679392A664825

Qu. 4 a) Derive an expression for finding "angle of heel" of a two wheeler negotiating a turn. (10)

b) A cast iron flywheel is required to absorb 25000 N-m of energy as speed is increased from 120 to 125 rpm. If wheel is to be solid disc having a diameter 8 times the thickness. Determine its diameter. Density of C.I.=7200 kg/m^3. (10)

Qu. 5 a) A horizontal gas engine running at 200 rpm has a bore of 210 mm and a stroke of 420 mm. The connecting rod is 924 mm long and the reciprocating parts weigh 18 kg. when the crank has turned through an angle of 30° from the inner dead center, the gas pressures on the cover and the crank sides are 500 kN/m^2 and 60 kN/m^2 respectively. Diameter of the piston is 40mm. Determine (i) turning moment on the crank shaft. (ii) thrust on the bearings. (iii) acceleration of the flywheel which has a mass of 8 kg and radius of gyration of 600 mm while the power of engine is 22 kW. (10)

b) In an epicyclic gear train as shown in Fig. 1, the wheel C is keyed to shaft B and wheel F is keted to shaft A. the wheels D and E rotate together on a pin fixed to arm G. the number of teeth on wheels C, D, E and F are 35, 65, 32 and 68 respectively.
If the shaft A rotates at 60 rpm and shaft B rotates at 28 rpm in opposite direction, find the speed and direction of rotation of arm G. (10)

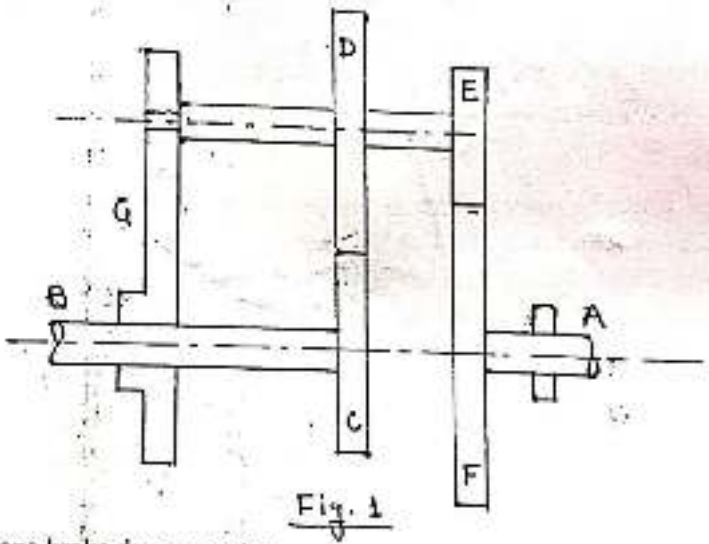

Fig. 1

Qu. 6 a) Explain Rope brake dynamometer. (05)
b) Write a note on Co-efficient of insensitiveness of governors. (05)
c) A multi-plate clutch transmits 55 KW of power at 1800 rpm. Coefficient of friction surface is 0.1. Axial intensity of pressure is not to exceed 160 kN/m^2. The internal radius is 80mm and is 0.7 times the external radius. Find the number of plates needed to transmit the required torque. (10)

Q.P. Code : 561402

(3 Hours) [Total Marks : 80

N B:

1. Question Number 1 is compulsory
2. Attempt any three questions from remaining
3. Draw suitable sketch to justify explanation and assume suitable data if required.

Q 1	A]	Distinguish between Quality and Cost	[5]
	B]	Compare Cost of Quality and value of Quality	[5]
	C]	Explain use of Laser Interferometer	[5]
	D]	Explain working of profile Projector	[5]
Q 2	A]	Explain the principal construction of Parkinson's Gear Tester	[10]
	B]	Explain the different modes of the Surface Roughness	[10]
Q 3	A]	Explain Two Wire method used in Screw Thread Measurement	[10]
	B]	Explain Pitter Gauge Interferometer	[10]
Q 4	A]	Explain types of Cost of Quality with suitable example	[10]
	B]	What are the objective of quality control	[10]
Q 5	A]	Explain use of X bar and R charts in quality control	[10]
	B]	Define " Control Chart " state objective of control chart for variables	[10]
Q6		Write short notes on any four	[20]
	A]	Tooth thickness measurement	
	B]	SQC tools	
	C]	Tool Maker Microscope	
	D]	Acceptance sampling	
	E]	Consumers Risk and Producers risk	

AUTO | sem IV | CBSGS | ICE | 29/5/17 (Original)

Q. P. Code : 600701

(3 Hours) Max. Marks: 80

Note:

1. Question No.1 is compulsory.
2. Solve any 3 from remaining 5 questions.
3. Total No. of questions to be attempted are Four
4. Assume suitable data, if necessary.

Q1

a) What is octane number and cetane number? 5

b) Explain CRDI and MPFI in brief. 5

c) State True or False and Justify, that, "The SI Engine is quality governed and CI Engine is quantity governed." 5

d) Willan's line method of calculation of F.P. is best suitable for SI or CI Engine and why? 5

Q2

a) Write the requirements of
a) Fuel injection systems of CI Engines b) Ignition systems in SI Engines. 10

c) An 8-cylinder, four-stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10 minutes test the dynamometer scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air 27 °C and 1 bar was supplied to the carburettor at the rate of 6 kg/ min. 10
Find (i) the brake power delivered (ii) the brake mean effective pressure (iii) the brake specific fuel consumption (iv) the brake specific air consumption (v) the brake thermal efficiency (vi) the volumetric efficiency and (vii) the air-fuel ratio.

Q3

a) An experimental four-stroke gasoline engine of 1.7 litre capacity is to develop maximum power at 5000 revolutions per minute. The volumetric efficiency is 75% and the air fuel ratio is 14:1. Two carburettors are to be fitted and it is expected that at maximum power the air speed at the choke is 100 m/s. The coefficient of discharge for the venture is assumed to be 0.80 and that of main jet is 0.65. An allowance should be made for emulsion tube, the diameter of which can be taken as 1/3 of choke diameter. The gasoline surface is 6mm below the choke at this engine condition. Calculate the sizes of a suitable choke and main jet. The specific gravity of the gasoline is 0.75. p_a and T_a are 1 bar and 300 K respectively. 10

b) Explain (any two) of the following: 10
a) Engine Pollution and the NORMS.
b) Alternative fuels
c) Losses considered in Fuel-Air cycle

[TURN OVER]

Q4

a) A four-cylinder, four-stroke diesel engine develops a power of 180 kW at 1500 rpm. The *b.s.f.c.* is 0.2 kg/kWh. At the beginning of injection pressure is 30 bar and the maximum cylinder pressure is 50 bar. The injection is expected to be at 200 bar and maximum pressure at the injector is set to be about 500 bar. Assuming the following: C_d for injector = 0.7 , *S.G.* for fuel = 0.875 , Atmospheric pressure = 1 bar, Effective pressure difference = Average pressure difference over the injection period Determine the total orifice area required per injector if the injection takes place over 15^0 crank angles. 10

b) Draw and explain the stages of combustion in SI engine and the effect of various Engine parameters on combustion. 10

Q5

a) A test on a two-stroke engine gave the following results at full load: 10

Speed = 350 rpm
Net brake load= 65 kg
mep= 3 bar
Fuel consumption= 4 kg / h
Jacket cooling water flow rate = 500 kg / h
Jacket water temperature at inlet = 20^0 C
Jacket water temperature at outlet = 40^0 C
Test room temperature = 20^0 C
Temperature of exhaust gases = 400^0 C
Air used per kg of fuel = 32 kg
Cylinder diameter = 22 cm
Stroke = 28 cm
Effective brake diameter = 1 m
Calorific value of fuel = 43 MJ /kg
Proportion of hydrogen in fuel = 15 %
Mean specific heat of dry exhaust gas = 1 kJ/kg K
mean specific heat of a steam = 2.1 kJ/ kg K
Sensible heat of water at room temperature= 62 kJ/ kg
Latent heat of a steam = 2250 kJ/ kg

Find ip,bp and draw up a heat balance sheet for the test in KJ/min and in percentage.

b) With the help of a sketch explain in **short** the working of carburettor having following arrangements 06
i) Compensating jet ii) Idling Jet

c) With suitable example/values, prove that, during the Load test of an engine increase in the load increases the mechanical efficiency of the engine. 04

[TURN OVER]

Q6 Explain any four of the following **(any four)**

a) Supercharging of IC Engine 5

b) Swirl and its types 5

c) Requirements of cooling and Lubrication system. 5

d) Detonation or knocking in SI Engine Vs in CI Engine. 5

e) The Pollution control treatments of Exhaust gases of Engine. 5

AUTO | Sem V | OLD | FM | 29/5/17

T2215 / T0438 FLUID MECHANICS

Q. P. Code : 599601

(3 Hours) **[Total Marks: 100]**

N.B.: (1) Question No.1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Figures to right indicate full marks.
(4) Assume suitable data if necessary and justify the same.

1. Answer the following : **20**
   (a) What is capillarity? Derive expression for height of capillary rise.
   (b) Explain stable and unstable equilibrium of floating bodies.
   (c) Is the flow net analysis applicable to rotational flow? If not, why?
   (d) What are the characteristics of laminar flow?

2. (a) Determe the components of rotation about the various axes for the following flows: **10**
      (i) $u = y^2$, $v = -3x$
      (ii) $u = 3xy$, $v = 3/2\ (x^2 - y^2)$
   (b) What is CFD? Explain CFD simulation? State its applications. **10**

3. (a) Derive Hagen Poiseullies equation and state assumptions. **10**
   (b) A solid cube of sides 0.5 m each is made of material of relative density 0.5. The cube floats in a liquid of relative density 0.95 with two of its faces horizontal. Examine its stability. **10**

4. (a) At a sudden enlargement of a water main from 240 mm to 480 mm diameter. The hydrauluic gradient rises by 10 mm. Calculate rate of flow. **10**
   (b) Water is flowing through a pipe having diameters 600 mm and 400 mm at the bottom and upper end respectively. The intesity of pressure at the bottom end is 350 KN/m^2 and the pressure at the upper end is 100 KN/m^2. Determine the difference in datum head if the rate of flow through the pipe is 60 liters/sec. **10**

5. (a) A pipe of 100 mm diameter is carrying water. If the velocities at the pipe centre and 300 mm from the pipe centre are 2 m/s and 1.5 m/s resp. And flow in the pipe is turbulent, calculate wall shering stress. **10**
   (b) Derive an expression for the volumetric flow rate of a fluid flowing through an orificemeter. **10**

TURN OVER

6. (a) A plate 450x150 mm has been placed longitudinally in a stream of crude oil. (sp gr. 0.925 and kinematic viosocsity of 0.9 stoke) which flows with velocity of 6 m/s. Calculate 10
   (i) friction drag on plate
   (ii) thicknesss of boundary layer at the trailing edge
   (iii) shear stress at trailing edge
   (b) Explain Prandlts mixing length theory 10

7. Explain 20
   (i) Von Karman Equation
   (ii) Vorticity and Circulation
   (iii) Moody's diagram.

****

AUTO | sem V | CBSGS | PP III | 05/06/17

T2225 / T0514 PRODUCTION PROCESS III

Q.P. Code : 600800

(3Hours) Total Marks : 80

Note :1) Question No.1 is compulsory.
2) Attempt any three questions from remaining six questions
3) Assume suitable data if required.
4) Figures to the right indicate full marks

1. (a) Cooling systems used in injection molds 20
(b) Laser Beam Machining
(c) Indexing Mechanisms used in Jigs and Fixtures
(d) Flexible Manufacturing System
(e) Differentiate between Combination and Compound Die with diagram
(f) Types of Automats

2. (a) Find the total pressure and dimensions of die & punch sets to produce a washer of 5.5 cm outside diameter with 2.5 cm diameter hole, from material 2 mm thick, having shear strength 350 N/mm^2. Take clearance 9% of stock thickness. 6
(b) What is Chemical Machining process? Explain in detail with the help of diagram. 6
(c) Discuss all sheet metal operations with help of diagrams. 8

3 (a) Write short notes on the following: 10
(i) Six Point Location principle for Jigs and Fixtures.
(ii) Drawing Press Tool for sheet metal.
(b) Explain about any five types of Clamping elements with diagrams in detail. 10

4 (a) Write about different types of transfer lines using neat sketches. 10
(b) What is agile manufacturing? Write about the components of Agile Manufacturing. 10

5. (a) Explain the following: 10
(i) Design principles of clamping elements and any 3 types of locating elements.
(ii) Abrasive Jet Machining.
(b) What are the different elements of Ejection system in Injection Molds? Explain any one ejection method. 10

6. (a) Write in detail about any five types of Jigs with neat sketches. 10
(b) Explain the following: 10
(i) Electrochemical Machining
(ii) Plastic Injection Mold Standardization

092EF8E177DD96EBE279CFD3C5F692AF

Mech / AUTO / SEM IV / CBSGS / 9-6-17
HT

T2225 / T0515 HEAT TRANSFER

Q. P. Code : 600900

(3 Hours)

[TOTAL MARKS 80

Instructions:

1) Question No-1 is compulsory.
2) Answer any **THREE** from the remaining **FIVE** questions.
3) Assume suitable data if necessary and state the same.

Q-1 Answer any 4 questions. [20]

a) What are the three modes of heat transfer? Define each with an appropriate example.

b) Define Fourier's Law of heat conduction, Newton's law of cooling and Stefan Boltzmann Law.

c) What do you mean by Fouling factor? What are the causes of fouling?

d) Define shape factor and write down the properties of shape factor.

e) How convection heat transfer occur? What are the differences between Natural Convection and Forced Convection.

Q-2 a) A steam pipe made of steel (K= 58W/m-K)has ID of 160mm and OD of 170mm. The saturated steam flowing through it is at 300°C, while the ambient air is at 50°C. It has two layers of insulation. The inner layer (k=0.17 W/m-K) is 30mm thick and the outer layer (k=0.023 W/mK) is 50mm thick. The heat transfer coefficient on inside and outside walls are 40W/m^{2}K and 5.8W/m^{2}K respectively. Find the rate of heat loss per unit length of the pipe [8]

b) A brick (k= 1.3 W/mK) wall 0.15 m thick separates combustion gases in a furnace from the atmosphere air at 30°C. The outside surface temperature is 100°C while its emissivity is 0.8 and the heat transfer coefficient for the outer surface is 20W/m^{2}K. Find the inner surface temperature of the wall and total heat lost to surrounding by both convection and radiation per unit area. [6]

c) A 0.5 m^2 plane, grey, diffuse, opaque surface with absorptivity = 0.7 is maintained at 500°C. With an irradiation of 10000 W/m^2. Determine (i) the Absorbed energy (ii) Emitted Energy (iii)Total Energy leaving the surface per unit Area. Take Stefan Boltzmann constant as 5.67 x 10^{-8} w/m^2 K^4. [6]

Q-3 a) For lumped heat analysis with usual notations prove that $\frac{\theta}{\theta_o} = e^{-BiFo}$ [8]

b) An egg with mean diameter of 45mm and initially at 18°C is placed in a boiling water pan for 4.5 minutes and found to be boiled to the consumer's taste. For how long should a similar egg for the same consumer be boiled taken from a refrigerator at 4°C. Take the following properties for egg. Verify whether the Lumped heat capacity analysis can be used or not. [6]
K =10W/m°C, ρ=1200kg/m^3, Cp = 2 kJ/kg°C, and h = 100 W/m^2°C.

c) Nitrogen gas at 0°C is flowing over a 1.2 m long , 2m wide plate maintained at 80°C with a velocity of 2.5 m/sec. properties of nitrogen, at film temperature, ρ =1.142kg/m^3, Cp=1.04 kJ/kg-K, kinematic viscosity (ν) =15.63 x 10^{-6} m^2/sec and Conductivity(k) = 0.0262 W/m-K. Find the average heat transfer coefficient and total heat transfer from the plate. Take the correlation **Nu = 0.664 Re $^{1/2}$ Pr $^{1/3}$**. [6]

[TURN OVER

Q-4 a) An incandescent lamp is approximated as a 75mm diameter sphere. The temperature of the glass bulb of a 60W lamp is 110°C when the ambient air is at 20°C. Estimate the heat transfer rate from the bulb surface by natural convection and by radiation if emissivity of the glass is 0.7. Properties of air at 65°C are $\mu = 2.03 \times 10^{-5}$ Ns/m^2, ρ=1.044Kg/m^3, Cp = 1007 J/kg-K, k= 0.02845w/m-K, Pr = 0.7188. Use the correlation $Nu = 0.589\ Ra^{(1/4)}$ and $\sigma = 5.67 \times 10^{-8}$ w/m^{2}K^4. [8]

b) Derive the relation $Nu = C\ (Gr)^m \times (Pr)^n$ for Natural Convection by using Dimensional Analysis. [8]

c) What do you mean by critical thickness of insulation? State its significance. [4]

Q-5 a) Water (Cp=4.187 kJ/kg-K) is heated at the rate of 1.4 Kg/sec from 40°C to 70°C by an oil (Cp=1.9kJ/kg-K) entering at 110°C and leaving 60°C in a counter flow heat exchanger. If Uo is 350 W/m^2-K calculate the surface area required. [8]
Using the same entering fluid temperature and same oil flow rate, calculate the exit temperature of oil and water and the rate of heat transfer when the water flow rate is halved (50% of initial flow).

b) Derive the relation for LMTD in the case of a parallel flow heat exchanger from fundamentals. [6]

c) Three hollow thin walled cylinders having diameters 10 cm,20cm and 30 cm are arranged concentrically. The temperature of innermost and outermost cylindrical surfaces are 80 K and 280 K respectively .Assume vacuum between annular spaces, find the steady state temperature attained by the cylindrical surface having diameter of 20 cm. Take $\varepsilon 1 = \varepsilon 2 = \varepsilon 3 = 0.05$. [6]

Q-6 a) Draw a neat boiling curve showing all boiling regimes of water. [4]

b) Derive the governing differential equation for Fin of uniform cross section. [8]

c) State and prove reciprocity theorem [8]