LJB-4

Paper / Subject Code: 31401 / Internal Combustion Engines

Auto / Sem 8 / BCE / CBCGS / 15/11/18

(3 Hours) **[Total Marks: 80]**

Note: 1. Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** **(5*4)**

a) A 4-stroke petrol engine delivers 40 kW with the mechanical efficiency of 80%. The fuel consumption of the engine is 0.4 kg/kW-hr and air-fuel ratio is 14:1. The heating value of the fuel is 43000 kJ/kg. find
(a)The indicated power, (b) The friction power, (c) The brake thermal efficiency, (d) The fuel consumption per hour and (e) The air consumption per hour

b) State the reasons for efficiency of actual cycle is much lower than the air standard cycle efficiency? List the major losses and differences in actual engine cycle and air standard cycle.

c) Describe briefly Engine Pollution and the Norms.

d) Explain the phenomenon of diesel knock. Compare it with the phenomenon of detonation in SI engines.

e) What is vapors lock? How is it related with ASTM distillation curve of the fuel?

Q.No.2 a) Willan's line test is conducted on a constant speed diesel engine operating at 1500 rpm and developing 50 kW power output at full load. The Willan's line may be considered as a straight line upto 60% load, with the slope of the line being 8° (eight degrees). The fuel consumption for this engine is 2.46 kg/h at 10% load. Calorific Value (C.V.) of fuel used is 42 MJ/kg. Evaluate (i) Frictional power (ii) Fuel consumption in kg/h at 60% load. (iii) Brake thermal efficiency at 60% load. (iv) Mechanical efficiency at 40% load. (v) Brake torque at 40% load. **(12)**

b) Justify the requirement of air motion and swirl in a C. I. Engine combustion chamber is much more stringent than in an S. I. Engine. **(08)**

Q.No.3 a) Discuss the advantages and disadvantages of petrol injection system with conventional carburetor system. Explain with diagram multipoint fuel injection system. **(10)**

b) Discuss the use of the biogas as a substitute fuel for S.I. Engine. Mention the modifications required with the engine system. **(10)**

TURN OVER

Q.No.4 a) A six cylinder, 4.8 Lit, supercharged engine operating at 3500rpm, has a overall volumetric efficiency 158%. The supercharger has an isentropic efficiency of 92% and mechanical efficiency is 87%. It is desire that air to be delivered to cylinder at 65°C and 180 kPa. while ambient conditions are 23°C and 98 kPa, index 1.4. Calculate (1

(i) Amount of air required to reduce temperature back to 65°C.

(ii) Engine power lost to run supercharger

b) State the types of electronic ignition system and explain Capacitance Discharge Ignition System (10

Q.No.5 a) Define pour point and flash point and discuss its importance in selecting the lubricating oil for I.C. Engine. (05

b) In a test of a CI engine under full load condition the following results were obtained: (15

(i) ip =33kW, (ii) bp =27kW, (iii) Fuel used = 8 kg/h, (iv) C.V. of fuel = 43 MJ/kg, (v) Inlet temperature of cooling water = 22°C, (vi) Temperature of cooling water outlet from engine = 75°C

(vii) Temperature of cooling water outlet from calorimeter = 48°C

(viii) Temperature of exhaust gas into calorimeter = 528°C

(ix) Temperature of exhaust gas out of calorimeter = 87°C

(x) Room temperature (ambient temperature) = 24°C

(xi) Cooling water flow rate through engine = 7 kg/mm

(xii) Cooling water flow rate through calorimeter = 12 kg/mm

(xiii) A/F ratio on mass basis = 20 :1

(xiv) Specific heat of water = 4.18 kJ/kg K

Evaluate the following: (1) Specific heat of exhaust gas, from the given data (value not to be assumed). (2) Draw the heat balance sheet on kW and percentage basis (3) Indicated, brake thermal and mechanical efficiencies. (4) Explain how and where you have made use of the First law of Thermo-dynamics in the evaluations above. (5) Write the assumptions made.

Q.No.6 a) An automobile has a 3.2 Liter. Five cylinder. 4-stroke diesel engine operating at 2400 rpm. Fuel injection occurs from 20° bTDC to 5° aTDC. The engine has a volumetric efficiency of 0.95 and operates with fuel equivalence ratio 0.8. Light diesel is used as fuel. Calculate: (i) Time for one injection and (ii) Fuel flow rate through an injector. Used density of air as 1.181 and $(A/F)_{st}$ = 14.5. (10

b) List engine management sensors and state its importance. (10

LB-4

Paper / Subject Code: 29801 / THEORY OF MACHINES-II

TE-V/AUTO/CBSGS/TOM-II/15/11/18

(Time : 3 Hrs.) (Marks:80)

N.B. i) Question **No.1** is compulsory
ii) Solve any **three** questions from the remaining
iii) Assume suitable data wherever necessary
iv) Figure to the right indicates marks

Q.1 Solve any **four** questions from following

a) Write the factors on which capacity of brakes depends. **(05)**

b) Explain how a governor differs from a flywheel? **(05)**

c) Explain the term steering, pitching and rolling? **(05)**

d) Explain reverted gear train with neat sketch? **(05)**

e) Draw and explain the turning moment diagram for four stroke I.C. engine. **(05)**

Q.2 a) With a neat sketch explain the working of a centrifugal clutch. **(06)**

b) Explain the working of an internal expanding shoe brake. **(04)**

c) A cone clutch is used to transmit 80 KW power at 1440 rpm. The cone angle of clutch is 40^0 and coefficient of friction is 0.3. If the mean diameter of the bearing surface is 350 mm and allowable normal pressure is 0.2 N/mm^2, determine the dimensions of conical bearing surface and the axial load. **(10)**

Q.3 a) Derive an expression for tensions in case of band and block brakes. **(10)**

b) An epicyclic train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B, which drives wheels D through an ideal wheel C, D being concentric with A. Wheels B and C are carried on an arm which revolves clockwise at 100 rpm about the axis of A and D. If the wheels B and D have 25 and 40 teeth respectively, find i) the number of teeth on C and ii) Speed and sense of rotation of C also draw the diagram. **(10)**

Q.4 a) Explain Proell governor with neat sketch; also derive an expression for height of a Proell governor. **(10)**

b) An I.C. engine running at 2000 rpm has the following data: **(10)**
Crank radius = 60 mm, length of connecting rod = 240, diameter of piston = 100 mm, mass of the reciprocating parts = 1.5 Kg; pressure on the piston during power stroke = 0.9 N/mm^2, displacement of piston from I.D.C. = 15 mm. Find
i) Net load on the gudgeon pin ii) Thrust in the connecting rod iii) Piston side thrust iv) The engine speed at which the above value becomes zero.

Q.5 a) What are the various types of gear boxes? Explain any one of them in details? **(10)**

b) Considering gyroscopic couple, derive the equation for the stability of a four wheel drive moving in a curve path. **(10)**

Q.6 a) A Hartnell governor having a central sleeve spring and two right angle bell crank lever moves between 290 rpm and 310 r.p.m. for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm resp. The levers are pivoted at 120 mm from the governor axis and the mass of each ball is 2.5 Kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine **(10)**

i) loads on the spring at the lowest and the highest equilibrium speeds &

ii) Stiffness of the spring.

b) What is dynamometer? Explain belt transmission dynamometer? **(10)**

Paper / Subject Code: 29802 / METROLOGY AND QUALITY ENGINEERING

AU TD/ V/ CBSGS/ MQE / 22-11-18

Q.P. Code: 21935

(3 Hours) Total Marks-80

NB : 1. Question No.1 is compulsory
2. Solve any three questions from remaining five
3. Assume suitable data wherever necessary

1. Answer any four questions :- [20]
   a) Differentiate between line and end standards.
   b) How gauging is different from measuring.
   c) Explain various surface roughness symbols.
   d) Differentiate between Variable chart and Attribute charts.
   e) Write short note on OC Curves

2. a) Explain Taylors principle of Gauge Design with suitable example [10]
   b) What is best wire size? Explain three wire method used in thread measurement [10]

3. a) Explain the working principle of optical Comparator. State advantages and limitation of using optical comparator. [10]
   b) Explain how will you compromise between quality and cost. [10]

4. a) Explain p and np chart with their application [10]
   b) Explain the phenomenon of interference of light. Explain how flatness of surface is measured by using interference phenomenon [10]

5. a) What are the seven tools of quality control and explain them briefly. [10]
   b) Explain the construction and working of Parkinson Gear tester [10]

6. Write short notes on : (any four) [20]
   a) Precision and accuracy
   b) Waviness and roughness
   c) Explain the concept of six sigma
   d) Tool makers microscope
   e) Double Sampling plans

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Paper / Subject Code: 31402 / Mechanical Measurements & Control

AUTO/ VI /BE(GS)/ NOV / 22-12-18

(3 Hours) **[Total marks: 80]**

Instructions:
1. **Question 1 compulsory.**
2. **Schematic Diagrams/sketches** carry weightage.
3. Attempt any **three** questions from the remaining **five** questions.
4. Assume suitable data, **if necessary**.

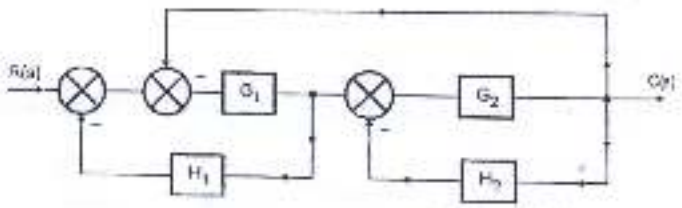
Q1) a) Temperature measurement devices, Enlist contact and non-contact types that are widely used in Industry and social life. Give their merits and demerits based on technology and handling of gazettes w.r.t. applications. 5

b) Differentiate between open and closed loop system with example. 5

c) What is the resolution in degrees of an encoder with 6 tracks? The number of increments per revolution is 2^6. 5

d) Comment on the stability for a given CE of a system $S^6+2+3s^5+6s^3+4s^4+5s^2+3s=0$ 5

Q2) a) Obtain the Transfer function for the Block diagram using Standard Block reduction rules 7



b) A strain gauge has gauge factor of 4. If the strain gauge is attached to a metal bar that stretches from 0.25m to 0.255m when strained, what is the percentage change in resistance? If the unstrained value of gauge is 120 Ω, what is the resistance valve of gauge after application of strain? 5

c) Illustrate the working principle for displacement measurement using "L.V.D.T." 8

Q3) a) Enumerate the types of pressure measurement devices w.r.t. levels i.e. low, medium and high pressures to be measured. State the working principle for each pressure level with example. 10

b) What are the different temperature compensation techniques used in the measurement of strain using strain gauges? Explain any two method's in details. 10

Q4) a) Illustrate a mathematical model for a thermal system given in the **fig: 1** and represent its transfer function. The bath temperature is θ_i and temperature indicated by thermometer is θ_o. 10

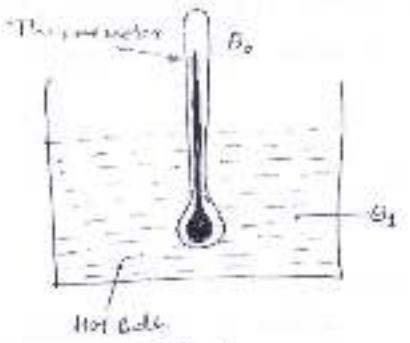


Fig: 1

b) A system is given by differential equation , $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 8x$, 10

where y = output and x = input. Determine all time domain specifications for unit step input and plot the response curve.

Q5) a) Addition of Zeros in the numerator of a given system G(s) H(s) improves the stability of the system, then If (S + 4) is a zero added to a given system G(s) H(s) = K / s (s^2 + 2s +2) (K, in numerator is a constant), Sketch the root locus and comment on its stability. 10

b) A servomechanism is designed to keep a radar antenna pointed at a flying aeroplane. If the aeroplane is flying with a velocity of 600 km/hr, at a range of 2 km and the maximum tracking error is to be within 0.1^0. Determine the required velocity error coefficient. 10

Q6) a) What do you understand by a State-space modeling of a system? Define state space and state variables. 5

b) Write a short note on PID controller. 5

c) A feedback system has G(s) H(s) = 100 (s+4) / s (s + 0.5) (s +10). Determine GM, PM, ω_{gc} and ω_{pc}. Draw Bode plot and comment on its stability. 10

(Time: 3 Hours) [Total Marks: 80]

N.B.: (1) Question no.1 is **Compulsory**.
(2) Attempt any **THREE** from question no.2 to 6.
(3) Figure to right indicates marks for that individual question.
(4) Assume suitable data if necessary with justification.

1 Answer any **Five** questions :- 20

a) Explain Thermal contact resistance & Thermal network resistance.
b) Explain Initial and Boundary conditions.
c) What is Efficiency and Effectiveness of fin?
d) Explain non-dimensional number used in convection heat transfer.
e) Define Shape factor and write down the properties of shape factor.
f) Explain construction and working of Heat Pipe.

2 (a) An electrical cable of 20mm diameter at a surface temperature of 70°C is insulated with rubber, which is exposed to atmosphere at 30°C. Calculate the most economical thickness of rubber insulation (k_r = 0.175 W/m K).Also calculate the percentage increase in heat dissipation and percentage increase in current carrying capacity when most economical thickness is provided.Take convective heat transfer coefficient (h_o) = 9.3 W/m²K.Assume that the surface temperature of the cable and outside convective heat transfer coefficient without insulation are same as those in insulated condition. 10

(b) Consider two very long cylinder rods of the same diameter but of different materials. One end of the rod is attached to a base surface maintained at 100°C, while the surfaces of rods are exposed to ambient air at 20°C. It is observed that, the temperatures of the rods were equal to the position x_A = 0.15m & x_B = 0.075m, where 'x' is measured from the base surfaces. If the thermal conductivity of rod A is k_A = 72 W/mK. Determine thermal conductivity of rod B. 10

3 (a) A two shell and four tube pass heat exchanger is used to heat glycerin from 20°C to 50°C by hot water, which enters thin wall 20mm diameter tube at 80°C and leaves at 40°C. The total length of the tube in the heat exchanger is 60 m. The convection coefficient on shell side is 25 W/m²K and that on tube side is 160 W/m²K. Calculate rate of heat transfer in the heat exchangers for clean surfaces of tubes. 08

Refer Figure 1.

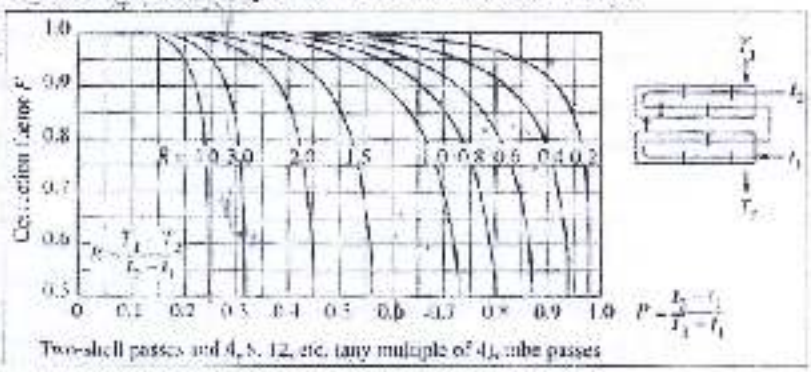


Figure 1: Correction factor graph

(b) A flat plate 1m wide and 1.5m long is maintained at 90°C in air with free stream temperature of 10°C flowing along 1.5m side of plate. Determine the velocity of the air required to have a rate of energy dissipated as 3.75kW. Consider convection is on both sides of plate. **08**

Use relation:

$Nu_L = 0.664\ Re^{1/2}\ Pr^{1/3}$ for laminar flow

$Nu_L = [0.036\ Re^{0.8} - 836]\ Pr^{1/3}$ for turbulent flow

Take properties of air at 50°C are:

$\rho = 1.0877\ kg/m^3$, $\mu = 2.029 \times 10^{-5}\ kg/ms$, $k_f = 0.028\ W/mK$

$Pr = 0.703$, $C_p = 1.007\ kJ/kg.K$

(c) What is Critical thickness of Insulation, for cylinder and sphere, its significance **04**

4 (a) A furnace wall is made of three layers. First layer is of insulation (k = 0.6 W/m K), 12cm thick. Its face is exposed to gases at 870°C with convection coefficient of 110 W/m^2K. It is covered with (backed with), a 10cm thick layer of fire brick (k = 0.8 W/m K) with a contact resistance of 2.6×10^{-4} K/W between first and second layer. The third layer is a plate of 10cm thickness (k = 4 W/m K) with a contact resistance between second and third layer of 1.5×10^{-4} K/W. The plate is exposed to air at 30°C with convection coefficient of 15 W/m^2K. Determine the heat flow rate and overall heat transfer coefficient. **08**

Assume area of wall surface = $1m^2$

(b) Explain Buckingham – π theorem **06**

(c) For Lumped system analysis with usual notation, **06**

Prove that $\frac{\theta}{\theta_0} = e^{-Bi\,Fo}$

5 (a) Consider a rectangular plate 0.2m x 0.4m is maintained at a uniform temperature of 80°C. It is placed in atmospheric air at 24°C. Compare the heat transfer rates from the plate for the following case **08**

Case i) When the vertical height is 0.2m

Case ii) When the vertical height is 0.4m

Use: $Nu_L = 0.59\ (Gr.\ Pr)^{1/4}$

Take properties of air at 325K are as follows:

$\nu = 1.822 \times 10^{-5}\ m^2/s$, $Pr = 0.703$, $K_{air} = 0.02814\ W/m\ K$

(b) Starting from basic derive an expression for effectiveness of parallel flow heat exchanger in terms of NTU and capacity ratio. **12**

6 (a) Write short note on (Any two) **10**

i) Numerical methods in heat transfer

ii) Hydrodynamic and Thermal boundary layer

iii) Intensity of radiation & Solid angle

(b) Two large parallel planes with emissivity 0.6 are at 900K and 600K. A radiation shield with one side polished and having emissivity of 0.05, while the emissivity of other side is 0.4 is proposed to be used. Which side of the shield to face the hotter plate, if the temperature of shield is to be kept minimum? Justify your answer. **10**

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Auto | CBSGS | sem-V | ICE | 29/11/2018

Paper / Subject Code: 29803 / I.C. ENGINEERING

Q. P. Code: 25264

Time: 3 hours **Marks: 80**

Note: 1. Q.No.1 is **compulsory.**
2. Attempt any **Three** question from Q.No.2 to Q.No.6
3. Make suitable assumptions if required

Q.No.1 Solve Any **Four** (5*4)

a) The engine of the car has four cylinders of 68 mm bore and 75 mm stroke. The compression ratio is 8. Determine the cubic capacity of the engine and the clearance volume of each cylinder.

b) Factors which decreases knock in C.I. Engines tend to increases knock in SI Engines.

c) What is mean by opposed type and radial type engine?

d) The diameter and stroke length of a single two stroke engine working on the constant volume cycle are 100 mm and 200 mm respectively with clearance volume 2.75liters. When the engine is running at 120 rpm the indicated mean effective pressure was 5bar and gas consumption 8.5 m^3/hr. If the calorific value of the gas used is 16350 kJ/kg.

Find: 1) Air standard efficiency
2) Indicated power developed by the engine and
3) Indicated thermal efficiency of the engine.

e) 'C.I. engine are quality governed and S.I. engine are quantity governed' Justify.

Q.No.2 a) John's automobile has a 3 liters SI V6 engine that operates on four stroke cycle at 3600 rpm. The compression ratio is 9.5, the length of connecting rods is 16.6 cm and the engine is square (B = S). At this speed, combustion ends at 20° after TDC. Further the engine is connected to a dynamometer which gives a brake output torque reading of 205 Nm at 3600 rpm. At this speed air enters the cylinder at 85 kPa and 60°C and mechanical efficiency of engine is 85%. Engine is running with air fuel ratio A/F = 15, a fuel heating valve of 44,000 kJ/ kg and combustion efficiency of 97%.Calculate (14)
(i) Cylinder bore and stroke length, (ii) Average Pistorf Speed, (iii) Clearance Volume, (iv) BMEP, (v) IMEP, (vi) FMEP, (vii) Friction power loss,
(viii) Brake specific power, (ix) Brake output per displacement volume,
(x) Fuel flow rate, (xi) Brake thermal efficiency, (xii) Indicated thermal efficiency, (xiii) Volumetric efficiency and (xiv) Mechanical efficiency

b) What are the criteria for a good combustion chamber? Explain with a neat sketches combustion chamber used in S.I. Engine. (6)

Q.No.3 a) Give brief classification of diesel injection system. Explain any one briefly (6)

b) Explain the phenomenon of combustion in C.I. Engines with Pressure – Crank Angle diagram. (6)

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c) In a petrol engine working on Otto cycle the temperature and pressure at the start of suction are 57 °C and 1 bar respectively. The compression ratio is 6; uses a fuel with calorific value of 42 MJ/Kg. The air –fuel ratio is 15:1. Determine the maximum pressure in the cylinder if the index of compression is 1.3 and and C_v for product of combustion = 0.678 + 0.00013 T, Where T is in Kelvin. Compare this value with that obtained when C_v = 0.0717 kJ/kg K (8)

Q.No.4 a) Explain the objectives of Supercharging. List the types of supercharger. (6)

b) An automobile has a 3.2 Liter, Five cylinder, 4-stroke diesel engine operating at 2400 rpm. Fuel injection occurs from 20° bTDC to 5° aTDC. The engine has a volumetric efficiency of 0.95 and operates with fuel equivalence ratio 0.8. Light diesel is used as fuel. Calculate: (i) Time for one injection and (ii) Fuel flow rate through an injector. Used density of air as 1.181 and $(A/F)_{st}$ = 14.5. (10)

c) What are the harmful effects of Knocking? (4)

Q.No.5 a) Differentiate **(Any Two)** (4*2)

i) Scavenging and Supercharging. ii) Wet sump and Dry sump lubrication.

iii) Water cooling and Air cooling

b) A carburetor is used for a 4-stroke, 4-cylinder square engine running at 40 rev/s has carburetor venture with 3 cm throat. Assuming the bore to be 10 cm, volumetric efficiency 75%, density of air to be 1.15 and co-efficient of air flow rate to be 0.75. Calculate suction pressure at throat. (10)

c) The torque developed by a 2-stroke engine is 100 N-m. What will be the torque developed by a 4-stroke engine keeping all other parameters constant? (2)

Q.No.6 a) A six cylinder, 4.8 Lit, supercharged engine operating at 3500rpm, has a overall volumetric efficiency 158%. The supercharger has an isentropic efficiency of 92% and mechanical efficiency is 87%. It is desire that air to be delivered to cylinder at 65°C and 180 kPa, while ambient conditions are 23°C and 98 kPa, index 1.4. Calculate (12)

(i) Amount of air required to reduce temperature back to 65°C.

(ii) Engine power lost to run supercharger

b) Explain briefly various methods to control Emission. (5)

c) Explain the terms squish, swirl and turbulence with reference to C.I. Engine. (3)

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Auto / Sem V / CBSGS / PP-III / 5/12/18

Paper / Subject Code: 29804 / PRODUCTION PROCESS-III

Time: 3 Hours **Marks: 80**

Instructions:

(1) Question No.1 is compulsory and Answer 3 Questions remaining 5 Questions.
(2) Assume suitable data wherever necessary
(3) Concepts explanation with suitable case study justification
(4) Diagram and sketches explanations are right to reserve full marks

Q1 Answer Any Four Questions 20

A. Introduction of Flexible Manufacturing System (FMS)
B. Write short note on Die and Punch of press tool design with neat sketches.
C. Transfer line machines
D. Stripper and stock guide
E. Selection of press tool machine

Q2

a. A 100mm diameter hole is to be punched in a 6mm thickness steel plate, The material is cold rolled C40 steel for which the maximum shear strength can be taken as 550 MPa. With normal clearance on the tools, cutting is complete at 40% penetration of the punch. Give suitable diameters for the punch and die, shear angle on the punch in order to bring the work within the capacity of a 200KN press available in the shop. **10**

b. Define Jigs device and explain any three with sketches each. 10
  a) Clamping devices
  b) Guiding devices
  c) Draw any two locating elements of Jigs

Q3

1. Explain principle, construction, working, applications, advantageous and limitations of Electric Discharge Machining (EDM) **10**
2. Explain basics system of plastic molding feeding, cooling and ejection system 10

Q4

1. Design of skill, knowledge and computer control of Agile manufacturing systems 10
2. Explain stock strip layout inner and outer diameter of washer 30mm and 50mm is to be cut and thickness of sheet metal was 2mm with sketches **10**

Q5

a) Explain principle, construction, working, applications, advantageous and limitations of Laser Beam Machining (**LBM**) 10
b) Explain Agile supply chain management principles, procedures, implementation in Production Process **10**

Q6 Answer Any Two Questions

A. A symmetrical cup of circular cross section with a 50mm diameter and 100mm having a corner radius of 2mm is to be obtained in C20 steel of 1mm thickness. Assume trim allowance 4mm. Determine (i) Blank diameter (ii) Number of draws required to produce the cup (iii) Drawing pressure **10**
B. Explain Flexible Manufacturing System (FMS) with sketches 10
C. Explain principle, construction, working, applications, advantageous and limitations of Abrasive Jet Machining (AJM) 10

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Auto/ Sem V/ CBCGS/ AS/ 5/12/18

Paper / Subject Code: 31404 / Automotive Systems

Time: 3 Hours **Total Marks: -80**

N.B: (1) **Question no** 1 is compulsory.

(2) Attempt **any three** out of remaining **five** questions.

Q.1 Answer the following questions:

a) Explain the working mechanism of hydraulic clutch. 05

b) Draw the sketches of 3 forward 1 reverse sliding mesh gearbox showing power flow in top and reverse gears. 05

c) Draw a neat sketch for propeller shaft. Explain the necessity of having a sliding joint for propeller shaft. 05

d) Draw a neat sketch of steering linkages and name the parts. 05

Q.2 a) A single plate clutch, with both sides effective has outer and inner diameters 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not to exceed 0.1 N/mm^2. If the coefficient of friction is 0.3, determine the power transmitted by a clutch at a speed of 2500 r.p.m. 10

b) Explain the construction and working of disc brake with the help of neat sketch. What are their advantages over drum brake? 10

Q.3 a) Explain the working of following with a neat sketch: 10

i. Wishbone type independent suspension

ii. Tie-rod rack and pinion type steering

b) Describe the working of torque converter. How does it differ from fluid coupling? 10

Q.4 a) Explain hotchkiss drive with a neat labelled diagram. How does it differ from torque tube drive? 10

b) Explain the working of synchromesh gearbox with neat labelled diagram. Explain its advantages over sliding and constant mesh type gear boxes. 10

Q.5 a) What are the different types of automotive wheels? Describe their construction, advantages and disadvantages. 10

b) Draw and explain semi-floating and full floating axles. 10

Q.6 a) Explain any five terms related to steering geometry with neat diagrams. 10

b) What is the principle of operation of hydraulic shock absorber? Describe the construction and working of telescopic shock absorber. 10

Auto | Sem V | CBSGS | HT | 12/12/18.

Paper / Subject Code: 29805 / HEAT TRANSFER

Q. P. Code: 39558

[3 Hours] **[Total Marks: 80**

N. B : (1) Question no.1 is **Compulsory**.
(2) Attempt any **THREE** from question no.2 to 6.
(3) Use illustrative diagrams wherever possible.
(4) Assume suitable data if necessary and mention it clearly.
(5) Use of steam table is permitted.

Q.1 Answer any **Four** questions : 20

a) What is the mode of heat transfer in vacuum? Define absorptivity, reflectivity and transmissivity and establish the relation among them.

b) Differentiate between the mechanism of filmwise and dropwise condensation.

c) What are the various types of fins? Discuss some of the important applications of fins

d) What is Heat exchanger? Draw Temperature profile for Parallel flow and Counter flow heat exchanger, Condenser, Evaporator.

e) A large window glass 0.5 cm thick (k = 0.78W/m.K) of heat transfer area of $1m^2$ is exposed to warm air at 25°C ,over its inner surface, with convection coefficient of 15 $W/m^2.K$.The outer air is at -15°C with convection coefficient of 50 $W/m^2.K$. Determine the heat flow rate through the glass.

Q.2 a) A steam pipe of length 1m and 5cm inside diameter and 6.5 cm outside diameter is insulated with a 2.75 cm radial thickness of high temperature insulation (k = 1.1 W/m.K). The surface heat transfer coefficient for inside and outside surfaces are 4630 $W/m^2.K$ and 11.5 $W/m^2.K$, respectively. The thermal conductivity of pipe material is 45 W/m.K. If the steam temperature is 200°C and ambient air temperature is 25°C,determine ;i) Heat lost per metre length of pipe ii) Temperature at the interface iii) Overall heat transfer coefficient based on inner and outer radius. 12

b) Write short note on- 8

i) Lump system analysis
ii) Heisler charts

Q.3 a) Air at 27°C is flowing across a tube with a velocity of 25 m/s. The tube could be either a square of 5 cm side or a circular cylinder of 5 cm diameter. Compare the rate of heat transfer in each case, if the tube surface is at 127°C. 10

Use $Nu = C(Re)^n (Pr)^{1/3}$

Where, C =0.027, n =0.805 for cylinder

C =0.102, n =0.675 for square tube.

Properties of air at 77°C,

ρ =0.955 kg/m^3, k= 0.03 W/mK, v =20.92 $X10^{-6}$ m^2/s, Pr=0.7,

Cp =1.009 kJ/kgK.

b) Prove that the total emissive power (E) of a diffuse surface is equal to π times its intensity of radiation (I). 10

Q.4 a) Steam in a condenser of a steam power plant is to be condensed at a temperature of 30°C with a cooling water from nearby lake, which enters the tube of condenser at 14°C and leaves at 22°C. The surface area of the tubes is 45 m^2 and an overall heat transfer coefficient is 2100W/m^2K.Calculate the mass flow rate of cooling water needed and rate of steam condensation in the condenser. Treat the condenser as counter flow heat exchanger. 10
Cp of water at 18°C is 4.18kJ/kg.K and latent heat of vaporization at 30°C is h_{fg} =2430.5kJ/kg

b) State and explain the following laws- 6
i) Plank's law
ii) Stefan Boltzman law

c) Explain time constant of a thermocouple. 4

Q.5 a) An enclosure measures 1.5 m x 1.75 m with a height of 2 m. Under steady state equilibrium conditions, the wall and ceiling are maintained at 525 K and 6
floor at 400 K. Determine the net radiation to floor.
ε_1(emissivity of ceiling and wall) =0.85
ε_2 (emissivity of floor) =0.75
take σ (Stefan-Boltzman constant)=5.67 x 10^{-8} W/m^2 K^4

b) The inside temperature of furnace wall, 200 mm thick, is1350°C.The mean thermal conductivity of wall material is 1.35W/m°C.The heat transfer coefficient of the outside surface is a function of temperature difference and is given by 6
h=7.85+0.08Δt
where Δt is the temperature difference between outside wall surface and surroundings .Determine the rate of heat transfer per unit area if the surrounding temperature is 40°C .

c) Derive an expression for the effectiveness of a parallel flow heat exchanger in terms of the number of transfer units (NTU) and the capacity ratio[C_{min}/C_{max}]. 8

Q.6 a) Explain physical significance of i) Reynold's number ii) Nusselt's number 4

b) In a quenching process a copper plate of 3 mm thick is heated up to 350°C and then suddenly ,it is dropped into a water bath at 25°C. Calculate the time required for the plate to reach the temperature of 50°C.The heat transfer coefficient on the surface of the plate is 28 W/m^2.K. The plate dimensions may be taken as length 40 cm and width 30 cm. 8
Take the properties of copper as
C=380J/kg.K, ρ =8800 kg/m^3.k=385W/m.K

c) Explain shape factor and its properties. Find the shape factor of a cylindrical cavity(enclosed on its surface with a flat surface) of diameter d and depth h with respect to itself. 8

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Paper / Subject Code: 31405 / Elective I: Press Tool Design

Duration -3 hours **Maximum marks -80**

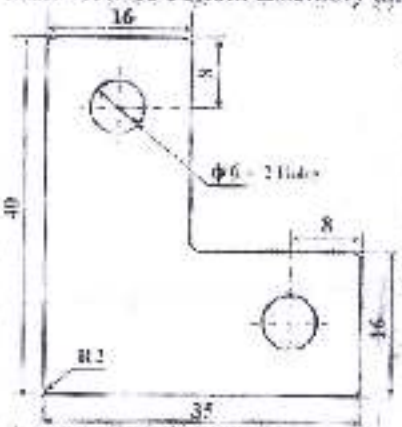
N.B.

(1) Question No.1 is compulsory and Answer 3 Questions out of remaining 5 Questions.
(2) Assume suitable data wherever necessary
(3) Figurers to the right indicate full marks.

Q.1 a) Give reasons for any five of the following statements. 15
i) Shaving operation is carried out after blanking operation.
ii) Guide bushes and pillars are always hardened.
iii) Optimum cutting clearance between die and punch should be provided to get proper cutting.
iv) Percentage reduction in second draw is always less than the percentage reduction in first draw.
v) Roll over radius is observed around the holes after piercing.
vi) Dowels are located diagonally across each other and as a part as possible.
vii) Material should be soft and annealed to carry out draw operation successfully.

b) Explain classification of presses. 05

Q. 2 a) Part shown in figure is to be produced on progressive die.
i) Draw an economical strip layout. Consider sheet size 400x 1200mm. 6
ii) Calculate tonnage required for the layout. 2
iii) Draw the following views of progressive die. 12
Plan view of bottom assembly and sectional front elevation.



Material: MS
Thickness: 2mm
Ultimate Shear Strength 340N/mm²
All dimensions are in mm

Q. 3 a) With the help of neat sketch explain the methods of reducing spring back in bending. 6
b) Explain various types of defects observed in deep drawing operation with causes and their remedies. 6
c) Illustrate the methods of punch mounting. 8

Q. 4 a) Explain double roll feed mechanism and also write its advantages. 7
b) Write benefits, limitations and applications of press tools. 7
c) Write safety precautions to be taken in press shop. 6

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Q. 5 a) Circular cup shown in figure is manufactured through deep drawing operation. Determine the following parameters. 15

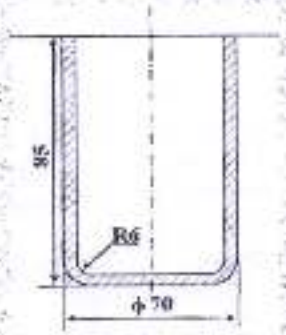
i) Blank size ii) Percentage reduction iii) Number of draws

iv) Radius on punches and dies

v) Die clearance, punch diameter and die openingsize.

vi) Drawing force and blank holding force

Material: Copper
Thickness: 1.5mm
Yield Strength: 350N/mm^2
All dimensions are in mm



b) With the help of neat sketch explain working & construction of redraw die 5

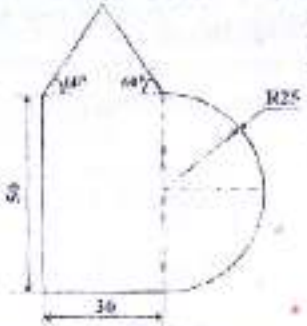
Q. 6 a) A press is designed to for giving 120 ton at 30°crank from BDC, when stroke is 20cm. prepare a monograph from BDC. From monograph explain: 10

i) Overloading of torque without overloading capacity

ii) Overloading of capacity without overloading of torque

b) Solve any two of the following 10

i) Find the centre of pressure of component shown in figure.



ii) Explain with the help of neat sketch embossing die.

iii) Explain with the help of neat sketch working & construction of trimming die.

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