AFICE QUESTION BANK

Unit 1

1. Explain why, engine fueled with alcohols has high volumetric efficiency in comparison to engine fueled with gasoline?
2. Explain why, higher compression ratio can be used in engine fueled with alcohol in comparison to engine fueled with gasoline?
3. Mention any three vegetable oils which can substitute. Diesel as a fuel for IC engines, in future?
4. List the merits and demerits of liquid fuels over gaseous fuel to be used in an IC engine?
5. Explain the fuel characteristics of Alcohols, CNG, LPG and Hydrogen?
6. Give a detail comparison between alcohols, vegetable oils, vegetable oil-based Biodiesel as their suitability for using SI and CI Engines?
7. Write about the different types of alternate fuels available?
8. List down 4 properties that are important in the selection of fuels for an Engine?
9. Explain about ethanol and methanol?
10. Write a brief note on DEE and DME?
11. Write about gaseous fuels?

Unit 2

1. Explain, why blends of ethanol or methanol are preferred as a fuel in engines, in comparison to pure alcohol fuels?
2. Discuss different properties of ethanol and methanol and compare them with gasoline?
3. What modifications are required in engine system, if either ethanol or methanol is used as substitute fuel?
4. Discuss different methods of producing ethanol and list out the merits and demerits of one method over other?
5. Explain the method used for producing producer gas?
6. Explain how the knocking tendency of SI engine is related to molecular structure of fuel?
7. State any 2 reasons for using ethyl alcohol as a SI Engine fuel?
8. What are the problems of using methanol in an Engine?
9. What are the deferent techniques of utilizing alternative liquid fuels?

Unit 4

1. Discuss the different properties of H2 if used as a substitute fuel for petrol. Discuss the difficulties to be faced if used as substitute fuel?
2. Compare LPG and petrol as fuel for SI engine?
3. What modifications are required with the engine if LPG is used as a substitute fuel? With a neat sketch explain LPG fuel feed system?
4. List down the advantages and disadvantages of using Bio diesel in SI Engine?

5. Explain the fuel characteristics of Alcohols, CNG, LPG and Hydrogen?
6. Explain the Performance Combustion and Emission characteristics of SI engine using Bio-diesel as a fuel?
7. Explain in detail about the effects of using biogas as fuel on engine performance and emission characteristics?
8. Explain fuel characteristics of alcohols, CNG, LPG and Hydrogen?
9. Discuss the salient properties of Hydrogen as a fuel?
10. List any 4 advantages of Bio diesel over petroleum-based fuels?
11. Can one use solid fuels for IC Engines? If so how?

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: TE-II**

MODEL PAPER 1

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A **(25 MARKS)**

1. a. Explain the concept of mean temperature of heat addition. (2M)

   b. How are the maximum temperature and maximum pressure in the Rankine cycle fixed (3M)

   c. What are the advantages and limitations of regenerative Rankine cycle over reheat cycle. Explain.(2M)

   d. What is the effect of regeneration on efficiency and specific work output of the steam power plant? Show the cycle on T-S plot.(3M)

   e. Draw the block diagram of reheat cycle with all components. (2M)

   f. Draw the T-S and H-S diagrams of reheat cycle representing all the salient points. (3M)

   g. When is reheating of steam recommended in a steam power plant? How does the reheat pressure get optimized? (2M)

   h. Define the terms HCV and LCV of a fuel and state which value is used and why is calculations affecting the performance of a power plant. (3M)

   i. What do you understand by the equilibrium constant of a chemical reaction? (2M)

   j. what is the heat of reaction? When is it positive and when negative? (3M)

PART B **(50 MARKS)**

2. (a) What do you mean by natural draught? What are the limitations of natural draught?
(b) What are the factors to be considered while designing chimney. Explain. [8+8]

OR

3. Inlet diffuser, nozzle, thrust. An aircraft powered by a turbojet engine, is working in ambient conditions : 22 kN/m2, 220 k, is flying with a speed of 130 m/s. The total head temperature rise in the compressor is 222 k. the total head conditions at turbine inlet :195 kN/m2 995 k; the total head efficiency of the turbine, 0.84. Find specific thrust of the engine in ight. Take nozzle isentropic efficiency, 0.91. [16]

	k	Cp kj/kg k
Air	1.4	1.0
Gases	1.3	1.15

4. The air in a gas turbine plant is taken in L.P compressor at 293 K and 1.05 bar and after compression it is passed through intercooler where its temperature is reduced to 300 K. The cooled air is further compressed in H.P. and then passed in the combustion chamber where its

temperature is increased to 750 ^{0}C by burning the fuel. The combustion products expand in H.P. turbine which runs the compressors and further expansion is continued in L.P. turbine which runs the alternator. The gases coming out from L.P. turbine are used for heating the incoming air from H.P. compressor and then expanded to atmosphere. Pressure ratio of each compressor = 2, Isentropic efficiency of each compressor stage = 82% , isentropic efficiency of each turbine stage =82%, effectiveness of heat exchanger = 0.72, air flow = 16 kg/s, calorific value of the fuel = 42000 kJ/kg , Cv(for gas)=1.0 kJ/kg K, Cp(for gas)= 1.15 kJ/kg K, (for air) = 1.4, (for gas) = 1.33. Neglecting the mechanical, pressure and heat losses of the system and fuel mass also determine the following:

(a) The power output

(b) Thermal efficiency

(c) Specific fuel consumption.

OR

5. (a) How are the maximum temperature and maximum pressure in the Rankine cycle fixed? Explain, with the help of `T-s' diagram(s).

(b) A steam turbine plant operates on the Rankine cycle. Steam is supplied at a pressure of 1 MN/m2 and with a dryness fraction of 0.97. The steam exhausts into a condenser at a pressure of 15 kN/m2. Determine the Rankine efficiency. [8+8]

6. (a) What are the advantages and limitations of velocity compounding?

(b) An impulse turbine stage having a row of nozzles and a single ring of blades. The nozzle angle is 200 and the blade exit angle is 300 with reference to the plane of rotation. The mean blade speed is 130 m/s and the velocity of steam leaving the nozzles is 330 m/s. Taking the blade friction factor as 0.8 and a nozzle efficiency of 85%, determine the work done in the stage per kg of steam, and the stage efficiency. [6+10]

OR

7. The following data refer to a particular stage of a Parson's reaction turbine Speed of the turbine = 1500 rpm, Mean diameter of the rotor = 1 metre Stage efficiency = 80%, Speed ratio = 0.7, Blade outlet angle = 20^0 Determine the available isentropic enthalpy drop in the stage. [16]

8. (a) What are the effects of super saturated ow on the performance of nozzle?

(b) Derive the expressions for maximum velocity and discharge through a convergent- divergent nozzle in terms of initial pressure, specific volume and ploytropic index. [6+10]

OR

9. (a) Draw the schematic diagram of counter flow jet condenser and explain its working.

(b) The surface condenser is designed to handle 16000kg of steam per hour. The steam enters the condenser at 0.09 bar abs. and 0.88 dryness fraction and condensate leaves the condenser at the corresponding saturation temperature. Determine the rise in cooling water temperature if the cooling water flow rate is 8.96 x 105 kg/hour. Assume that the pressure is constant throughout the condenser. [8+8]

10. a) Explain the regenerative cycle with the heat sketch?

b) In reheat cycle the initial steam pressure and the maximum temperature and 150bar and 550-centigrade respectively. If the condenser pressure is 0.1bar and the moisture at the condenser inlet is 5% and assuming ideal process determine i) Reheat pressure ii) Cyclic efficiency iii) Steam rate. [8+8]

OR

11. a) List out mountings and explain briefly.

b) Draw neat sketch of Benson Boiler and Explain briefly.

c) What is difference between economic and super heater? Why are they used in boiler?

[5+5+6]

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: TE-II**

MODEL PAPER 2

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A

1. a. What do you understand by the term adiabatic flame temperature? Explain the salient features. (2M) **(25 MARKS)**

b. Write a short note on stoichiometric air-fuel ratio.(3M)

c. How are the steam boilers classified? (2M)

d. What are the factors to be considered while selecting a boiler? (3M)

e. Describe the working of a Benson boiler with the help of neat sketch. (2M)

f. Sketch and describe the working of Lancashire boiler. (3M)

g. Explain in detail the working of locomotive boiler with a neat sketch. (2M)

h. State which type of boiler is used for power generation and why? (3M)

i. Write down the advantages of high pressure boilers. (2M)

j. Explain fusible plug used as boiler mounting with the neat sketch. (3M)

PART B **(50 MARKS)**

2. A convergent divergent nozzle for a steam turbine has to deliver 400 kg of steam per hour under a supply condition of 10 bar dry and saturated and a back pressure of 0.1 bar. Initial velocity of steam is 150m/s. Neglect friction. Find throat and outlet areas. [16]

OR

3. A surface condenser fitted with separate air and water extraction pumps has a portion of the tubes near the air pump suction screened off from the steam so that the air is cooled below the condensate temperature. The steam enters the condenser at 38°C and the condensate is removed at 37°C. The air removed has the temperature of 36°C. If the total air infiltration from all sources together is 5kg/hr. Determine the volume of air handled by the air pump per hour. What would be the corresponding value of the air handled if a combined air condensate pump was employed. Assume uniform pressure in the condenser. [16]

4. A turbine is supplied with the steam pressure of 32bar and a temperature of 4100°C. The steam then expands isentropically to a pressure of 0.08bar. Find the dryness fraction at the end of expansion and thermal efficiency of the cycle. It the reheated at 5.5 bar to temp of 400°C and then expands isentropically to pressure of 0.08 bar, what will be the dryness fraction and thermal efficiency of the cycle? [16]

OR

5. a) What is the compounding of steam turbine? Discuss various methods of compounding.

b) In a 50% reaction turbine stage running at 3000rpm the exit angle are 30 and inlet angle are 50% the mean diameter is 1m. The steam flow rate by 1000kg /minute and stage efficiency is 85%. Determine (i) power output of stage (ii) specific enthalpy drop in the stage (iii) percentage increase in relative velocity of the steam when it flows over the moving blades. [8+8]

6. a) Explain with neat sketch of open cycle gas turbine plant.

b) Enumerate the difference between open cycle gas turbine plant and closed cycle turbine plant. [8+8]

OR

7. a) Where is rocket propulsion used? What are the kinds of rocket propellants?
b) Describe liquid propellant rocket engine with neat sketch. [8+8]

8. In a steam power plant operating on an ideal Rankine cycle, the steam enters the turbine at 3 MPa and 400 ^{0}C and is exhausted at 10 kPa. Assuming all ideal processes, determine the following:
a) Thermal efficiency of the cycle and condition of steam at the exit of turbine

b) Thermal efficiency if steam is supplied at 3 MPa and 500 ^{0}C and condition of steam at he exit of turbine. Estimate the increase or decrease of thermal efficiency due to super heating and comment on the result of thermal efficiency and steam exit condition from turbine comparing the two cases. [15]

OR

9. The following readings were recorded during a 2 hour boiler trial on a
boiler: Feed water supplied : 14000 kg
Boiler working pressure : 10 bar
Dryness fraction of the steam : 0.96
Temperature of feed water entering Economizer : 35 ^{0}C
Temperature of feed water leaving Economizer : 90 ^{0}C
Temperature of steam leaving super heater : 250 ^{0}C
Coal burnt : 1500 kg
Calorific value of the coal : 33500 kJ/kg
Conduct Boiler Trial based on the data. Also evaluate the overall efficiency of the boiler. Also evaluate the equivalent evaporation from and at 100 ^{0}C. [15]

10. a) Give the physical explanation of Critical pressure ratio of Convergent nozzle.

b) In a convergent – divergent nozzle, the steam enters at 15 bar and 300 ^{0}C and leaves at a pressure of 2 bar. The inlet velocity to the nozzle is 150 m/s. Find the required throat and exit areas for a mass flow rate of 1 kg/s. Assume the nozzle efficiency to be 90%. [7+8]

OR

11. Steam issues from a nozzle of a simple impulse turbine with a velocity of 610 m/s. The nozzle angle is 20 ^{0} and the diameter of the rotor is 62 cm and runs at 9500 RPM. The blade outlet angle is 30 ^{0} and the friction factor is 0.8. Calculate the power developed for kg of steam and diagram efficiency by drawing velocity triangles. [15]

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MODEL PAPER 3

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A

1. a. What is the function of a nozzle? List the various types of nozzles. (2M)

b. Explain the terms over-expanding and under-expanding as applied to a fluid flow through a nozzle. (3M) **(25 MARKS)**

c. Explain the importance of using velocity coefficient in nozzles. (2M)

d. Explain the criteria to decide the shape of the nozzles. (3M)

e. Explain what is the meant by critical pressure ratio of nozzle. (2M)

f. Define degree of undercooling and degree of supersaturation. (3M)

g. Briefly explain the classification of steam turbines. (2M)

h. Explain the impulse principle. Why compounding is necessary in impulse turbines? (3M)

i. Explain the variation of pressure and velocity in a velocity compounded impulse turbine. (2M)

j. What are the differences between impulse and reaction turbines? Explain. (3M)

PART B (50 MARKS)

2. a) Compare the impulse and reaction turbines.
b) Show that for a Parson's reaction turbine, the fixed and moving blades are of same shape. [7+8]

OR

3. a) Give the comparison between jet and surface condensers.

b) A surface condenser of 0.75 m^3 capacity contains saturated steam and air at a temperature of 45 ^{0}C and an absolute pressure of 0.13 bar. Air leaks further into condenser and the hence the absolute pressure of the condenser is increased to 0.28 bar and the temperature falls to 38 ^{0}C. Calculate the mass of air leaked into the condenser. [7+8]

4. In a reheat regenerative gas turbine plant, the pressure ratio of the compressor is 4:1. The temperature of the gases entering the HP turbine and LP turbine are 660 ^{0}C and 625 ^{0}C respectively. Condition of air entering the compressor is 1 bar and 17 ^{0}C. The effectiveness of the regenerative heat exchanger is 0.75. Calculate the pressure of gases entering the LP turbine and the overall plant efficiency. [15]

OR

5. a) Differentiate between air breathing engines and rockets.

b) With the help of a neat diagram, explain the function of a pulse jet engine along with its applications. [7+8]

6. In a reaction turbine, the blade tips are inclined at 350 and 200 in the direction of motion. The guide blades, but reversed in direction, At a certain place in the turbine, the drum diameter is 1 metre and the blades are 10 cm high. At this place, the steam has a pressure of 1.75 bar and dryness 0.935. If the speed of this turbine is 250 rpm and the steam passes through the blades without shock, and the mass of steam flow and power developed in the ring of moving blades. [16]

OR

7. (a) Draw the graph `blade-speed ratio' versus `diagram efficiency' of a reaction turbine.

(b) Describe the constructional features and working principle of a de Laval turbine. Also draw the `pressure' and `velocity' graphs of this turbine. [4+12]

8. A turbo jet engine inducts 51 kg of air per second and propels an aircraft with an uniform ight speed of 912 km/h. The isentropic enthalpy change for the nozzle is 200 kj/kg and its velocity co efficiency is 0.96. The fuel air ratio is 0.0119, the combustion efficiency is 096 and the lower heating value of the fuel is 42mj/kg. Calculate

(a) The thermal efficiency of the engine,

(b) The fuel flow rate in kg/h and tsfc,

(c) The propulsive power in kw

(d) The thrust power and

(e) The propulsive efficiency. [16]

OR

9. (a) What are the advantages of unleaded petrol and premium petrol? (3+3)

(b) The analysis of ue gas by the Orsat's apparatus showed: carbon dioxide = 13.2%, carbon monoxide = 1.8%, oxygen = 3.2%, and nitrogen = 81.8%. Assuming that the fuel contains only the carbon and hydrogen atoms, calculate.

i. The ratio of carbon to hydrogen atoms,

ii. The molar composition of the wet ue gases? [6+10]

10. A surface condenser deals with 13625 kg of steam per hour at a pressure of 0.09 bar. The steam enters 0.85 dry and the temperature at the condensate and air extraction pipes is 360C. The air leakage amounts to 7.26 kg/hour. Determine:

(a) The surface required if the average heat transmission rate is 3.97 kJ/cm2 per second.

(b) The cylinder diameter for the dry air pump, if it is to be single acting at 60 r.p.m. with a stroke to bore ratio of 1.25 and volumetric efficiency of 0.85.[16]

OR

11. (a) Explain the phenomenon overexpansion and underexpansion in a covnvergent divergent Nozzle.

(b) Steam enters a nozzle operating at steady state with a pressure of 40 bar, a temperature of 4000C, and a velocity of 10 m/s. The steam flows through the nozzle with negligible heat transfer, and no significant change in potential energy. At the exit, the pressure is 15 bar and the velocity is 665 m/s. The mass flow rate is 2 kg/s. Determine the exit area of the nozzle in m^2. [8+8]

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: TE-II**

MODEL PAPER 4

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A

1. a. What are the objectives of a steam condenser in a steam power plant? (2M)

b. Mention the main requirements of a steam condensing plant. (3M) **(25 MARKS)**

c. What are the functions of condensers in a steam power plant? Explain with a simple diagram. (2M)

d. How the steam condensers are classified? Explain with basic principle and operation. (3M)

e. Draw the schematic diagram of parallel flow side condenser and explain its working principle. (2M)

f. Explain the working of high level jet condenser. (3M)

g. Explain the working of ejector condenser. (2M)

h. Discuss the differences between down flow and central flow condensers. (3M)

i. How is gas turbine cycles classified? (2M)

j. How to classify the jet propulsive engines. (3M)

PART B **(50 MARKS)**

2. A 4500 kW gas turbine generating set operates with two compressor stages; the overall pressure ratio is 9:1. A high pressure turbine is used to drive the compressors, and a low-pressure turbine the generator. Temperature of the gases at entry to the high pressure turbine is 6250C and the gases are reheated to 6250C after expansion in the first turbine. The exhaust gases leaving the low-pressure turbine are passed through a heat exchanger to heat air leaving the high pressure stage compressor. The compressors have equal pressure ratios and inter cooling is complete between the stages. The air inlet temperature to the unit is 200C. The isentropic efficiency of each compressor stage is 0.8, and the isentropic efficiency of each turbine stage is 0.85, the heat exchanger thermal ratio is 0.8. A mechanical efficiency of 95% can be assumed for the both the power shaft and compressor turbine shaft. Neglecting all pressure losses and changes in kinetic energy calculate:

(a) The thermal efficiency

(b) Work ratio of the plant.

(c) The mass flow in kg/s. Neglect the mass of the fuel and assume the following:

For air: Cpa = 1.005 kJ/kg K and = 1.4. For gases in the combustion chamber and in turbines and heat exchanger, Cpg = 1.15 kJ/kg K and = 1.333. [16]

OR

3. (a) With a neat sketch, describe the principle of working of an induced draught.

(b) Derive the expression for maximum flow of hot gas through a chimney of height `H' and cross sectional area `A'. [8+8]

4. (a) Explain the terms\over expanding" and \under expanding" as applied to a fuid flow through a nozzle.

(b) Describe the changes which occur in a convergent divergent nozzle as the back pressure is slowly increased from the design pressure up to the pressure at entry. [8+8]

OR

5. A closed cycle gas turbine using Argon as the working fluid has two compressions with perfect inter cooling. The overall pressure ratio is 9 and pressure ratio in each stage is equal. Each stage has an isentropic efficiency of 85%. The turbine is also two stage with equal pressure ratio with inter change reheat to original temperature. Each turbine stage has an isentropic efficiency of 90%. The turbine inlet temperature is 1100K and the compressor inlet is 303K. Find

(a) work done per kg of fluid flow

(b) work ratio

(c) The overall cycle efficiency. The properties of argon are Cp= 0.5207 kJ/kg K, =1.667 and R=0.20813 kJ/kgK. [16]

6. One stage of an impulse turbine consists of a row of nozzles and one row of moving blades. The steam enters the nozzles at a pressure of 15 bar, dry saturated with a velocity of 130 m/s. The pressure drops along the nozzles to 9 bar. The nozzles have discharge angle of 200 and the steam passes into the blades without shock. If the velocity coefficient for nozzles is 0.9, determine for maximum efficiency conditions

(a) the blade angles for equiangular blades

(b) the blade efficiency

(c) stage efficiency. [16]

OR

7. At a stage in a reaction turbine, the mean blade ring diameter is 1 m and the turbine runs at a speed of 50 rps. The blades are designed for 50% reaction with exit angles 300 and inlet angles 50^0. The turbine is supplied with a steam at a rate of 6×10^5 kg/hr and stage efficiency is 85 %, determine the power output. [16]

8. (a) What is thrust augmentation of a turbojet engine? How can it improve the performance of the engine?

(b) What are different types of pressurization systems used in liquid propellant rocket engines? [8+8]

OR

9. (a) Does it make a difference to the enthalpy of combustion, if it is burnt with pure Oxygen or air? What about the adiabatic ame temperature?

(b) Determine the adiabatic combustion temperature for the steady flow burning of propane (C_3H_8) with 100% excess air with propane and air supplied at 1 bar, 25^0 C. Assume that reaction goes to completion. [6+10]

10. (a) Draw the schematic diagram of high level jet condenser and explain its working principle.

(b) What are different air leakage sources of a steam condenser? Explain the methods to eliminate air leakages. [8+8]

OR

11. (a) Explain the difference between the fire tube and water tube boilers. What are their merits and demerits?

(b) Briey explain the working of Babcock and Wilcox boiler with the help of a neat sketch. [8+8]

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: TE-II**

MODEL PAPER 5

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A (25 MARKS)

1. a. What are the important properties of a good propellant? (2M)

b. Why liquid propellants are preferred in rocket propulsion? (3M)

c. With the help of a neat diagram, explain the function of solid propellant rocket engine? (2M)

d. Where rocket propulsion is used? What are the kinds of rocket propellants? (3M)

e. What are the advantages and disadvantages of rocket engine? (2M)

f. Describe the effect of altitude on turbojet unit. (3M)

g. Define (i) Ram efficiency (ii) Propeller efficiency. (2M)

h. Define (i) Thrust (ii) Thrust power (3M)

i. What is meant by jet propulsion? (2M)

j. Explain about isentropic compression efficiency? (3M)

PART B (50 MARKS)

2. a) The steam is supplied to a steam turbine at a pressure of 32 bar and a temperature 410°C. The steam then expands isentropically to a pressure of 0.08bar. Find the dryness fraction of steam at the end of expansion and thermal efficiency of the cycle. If the steam is reheated at 5.5 bar to a temperature of 395° C and then expands isentropically to 0.08 bar, what will be the dryness fraction at the end of final expansion and the thermal efficiency of the cycle?

b) Why is the actual temperature of real gas combustion process much less than the adiabatic flame temperature.

OR

3. a) With the help of a neat diagram explain the working principle and construction of any water tube boiler.

b) Calculate the height of chimney required to produce a draught equivalent to 1.7cm of water if the flue gas temperature is 270°C and ambient temperature is 22°C and minimum amount of air per kg of fuel is 17kg.

4. a) Steam enters an impulse wheel having a nozzle angle 200 at a velocity of 450 m/sec. The exit angle of moving blade is 200 and the relative velocity of steam may be assumed to remain constant over the moving blades. If the blade speed is 180m/sec; Calculate i) Blade angle at inlet, ii) Work done per kg of steam, iii) Power developed if rate of steam flow is 1.6 kg/sec.

b) Explain the phenomenon of meta stable flow of steam through a nozzle. What is the significance of Wilson's line in it?

OR

5. a) Deduce an expression for work done per stage of a reaction turbine.

b) Following particulars refer to a compound turbine: Inlet pressure and temperature to the first stage are: 20 bar and 2500C, pressure at entrance to next stage is 1.5 bar and exhaust pressure is 0.05 bar. Stage efficiency is 0.77. Determine i) Internal heat drop, ii) If external losses are 4% of total isentropic heat drop, calculate overall efficiency ratio, iii) Reheat factor.

6. a) With the help of a neat diagram explain the working of a regenerative cycle gas turbine also compare the performance with simple cycle.

b) Derive an equation for thermal efficiency of a simple gas turbine cycle in terms of pressure ratio and specific heat ratio.

OR

7. a) State the fundamental difference between the jet propulsion and rocket propulsion.

b) A jet plane having 2 jets works on turbo-jet system. It flies at a speed of 800km/hr at an altitude where density of air is 0.15 kg/m3. The propulsive efficiency is 55%. The drag on the plane is 6500N. Calculate i) Absolute velocity of jet ii) quantity of compressed air and iii) diameter of jet.

8. a) Explain the concept of Mean temperature of heat addition. b) Define Stoichiometric quantity of air.

OR

9. a) What is the need of compounding steam turbine and list out different methods of compounding?

b) Draw velocity triangle for 50% reaction steam turbine.

10. a) Draw the T-s diagram of a reheat gas turbine cycle.

b) Define propulsive efficiency and thermal efficiency of jet propulsion system.

OR

11. (a) Does it make a difference to the enthalpy of combustion, if it is burnt with pure Oxygen or air? What about the adiabatic flame temperature?

(b) Determine the adiabatic combustion temperature for the steady flow burning of propane (C_3H_8) with 100% excess air with propane and air supplied at 1 bar, 25 ^{0}C. Assume that reaction goes to completion.

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MECHANICAL DEPARTMENT **SUB: EMET**

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

MODEL PAPER 1

PART A (25 MARKS)

1. a. Define terms of a)Allowance b) Limits c) Tolerance d)fits? (2M)
b. Name the various instruments used for measuring angles? (3M)
c. Explain the symbols used to represent surface roughness? (2M)
d. What is Optical flat and what are its uses? (3M)
e. What are the main instruments required for geometric test for testing machine tools (2M)
f. Differentiate between measuring instrument and comparator. (3M)
g. Discuss in detail the salient features of the system of limits and as per Indian standard (2M)
h. What is the effect of pitch error on effective diameter? (3M)
i. Describe the working mechanism of dial indicator? (2M)
j. Difference between primary texture and secondary texture? (3M)

PART B (50 MARKS)

2. a) What is Interchangeable manufacture? Briefly describe different types of Interchange ability?

b) A gear ring of 85 mm diameter bore is fitted on to a hub resulting in H7/J6 fit. Calculate the tolerances and hence the limits of size for hub and gear bore. Specify the type of fit. The diameter step is 80-100mm. The fundamental deviation for J shafts is 0.009mm.

OR

3. a) State the principle of a micrometer & sketch outside micrometer and name its various parts?

b) With the help of sketch describe a vernier type micrometer. How do you calculate its least count?

4. Describe the following methods of checking straightness of a surface?

i) Auto collimator method ii) Straight edge method.

OR

5. a) Explain the construction and working of a profilograph for surface roughness measurement?

b) Explain the following terms i) Roughness ii)waviness iii) Lay

6. a) Explain the nomenclature of screw thread with the help of a neat sketch?

b) Discuss the various types of pitch errors along with their causes and effects?

OR

7. a) Discuss the Principles of NPL flatness interferometer?

b) Explain how flatness errors of lapped surfaces are measured with an optical flat?

8. Define terms: Clearance; interference; allowance fit. Draw a conventional diagram for explicit representation of these terms on a shaft and hole pair. ii. he hole and shaft assembly of 90 mm nominal size have tolerances specified as mm for shaft. Determine i. Maximum and minimum clearance (interference) attainable. ii. Allowance (iii) Hole and shaft tolerances (iv) Fundamental deviation (v) MML for shaft and hole (vi) Type of fit. Sketch these values on a conventional diagram.

OR

9. a)Explain the details of construction, Principle and operation of stylus probe?

b) What are the advantages and limitations of stylus probe?

10. Describe taking linear measurements with "inside micrometer" ii. Describe the calibration of slip gauges by Eden-Rolt millionth comparator.

OR

11. Describe with the help of a neat sketch the working of "Gear tooth vernier caliper".

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: EMET**

MODEL PAPER 2

PART A (25 MARKS)

1. a.Give the complete classification of clearance fit. Explain them with the help of suitable examples (2M)

b. Explain with neat sketches, the construction and application of vernier bevel protractor? (3M)

c. Explicate the principle of operation of optical flats (2M)

d.What is profilomete? (3M)

e. Explain the important of British standard system and ISO of limits and fits? (2M)

f. Enumerate various interferometers. (3M)

g. Enumerate various screw thread parameters for metrological measurement. (2M)

h. Describe the working principle of electronic comparators. (3M)

i. What are angle gauges? Discuss their use in metrology lab (2M)

j. Differentiate between measuring instrument and comparator. (3M)

PART B (50 MARKS)

2. a)What are the various orders of geometrical irregularities on surfaces? How these are classified?

b) As per ISI specification how many roughness grade numbers are specified? Draw the roughness symbol for each grade and indicate its Roughness values?

OR

3. a) What are slip gauges ? For what purpose they are used?

b) Give the classification of slip gauges according to their accuracy?

4.Describe the following alignment tests on a lathe for i. Level of installation ii. Parallelism of tail stock sleeve to saddle movement.

OR

5. a) Explain how flatness errors of lapped surfaces are measured with an optical flat?

b) Describe the three methods of testing straight edge of one meter long?

6. State uses of i)Tool makers flat ii) angle plate iii) V Block iv) Straight edge

OR

7. Difference between a) Roughness and waviness ?

b) Direct and Indirect methods of Roughness measurement?

8. A 35 mm diameter shaft and bearing ate to be assembled with clearance fit. The tolerances and allowances are as under

Allowances=0.003mm

Tolerance on hole= 0.007mm

Tolerance on shaft=0.002 mm

OR

9. Explain terms : Interchageablity and selective assembly. Enumerate the differences between them.

10. a) What is the principle of sine bar and limitations of sine bar?

b) What are the types of sine bar?

c) Explain the uses of sine bar?

OR

11. a)What is the role of CMM?

b) Types of Coordinate Measuring machines?

c) What are the advantages & Applications of CMM?

MALLAREDDY COLLEGE OF ENINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: EMET**

MODEL PAPER 3

PART A (25 MARKS)

1. a. Explain difference between Tolerance and Allowance (2M)
b. Explain the Taylors principle of gauge design (3M)
c. Name the various types of interferometers (2M)
d. What are the factors Affecting Surface Roughness (3M)
e. Discuss about types of Assemblies used in engineering (2M)
f. Explain the principle of spirit level
g. Difference between comparator and a gauge (2M)
h.What are the various manufacturing errors in gear (3M)
i. What is an Optical flat? (2M)
j. State how surface finish is designated on drawings (3M)

PART B (50 MARKS)

2. a) Explain the relationship between the Cost Vs tolerance
b) Draw the conventional diagram of limits and fits and explain the terms:
i) Basic size, ii) Upper deviation ,iii) Lower deviation ,iv) fundamental deviation and v) Zero line

OR

3. What is wringing? Explain the procedure for wringing of slip gauges?

4. Describe surface measurement with inspection by comparison methods?

OR

5. a)Explain the use of rollers and slip gauges for the measurement of minor diameter of internal threads?

b) Explain how effective diameter of an external thread can be measured using two wire method?

6. Describe briefly with neat sketches a) Sine centre b) Sine table?

OR

7. a) what are the advantages of Interchangeability
b) Explain briefly the difference between the interchangeable manufacturing and selective assembly
8. a) Explain the principle of an optical projector.

b) Explain the working of an optical projector and applications with neat diagram.

OR

9. a) In the measurement of surface roughness, heights of 10 successive peaks and valleys were measured from a datum as follows

Peaks :	45	42	40	35	35	µm
Valleys:	30	25	25	24	18	µm

Determine the Rz value of the surface?

b) Write short note on grades for specifying the surface texture?

10. Elucidate the Effective diameter measurement by two wire method

OR

11. a)What is Optical flat and what are its uses?

b) Describe Michelson's interferometer?

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: EMET**

MODEL PAPER 4

PART A (25 MARKS)

1. a. What are the advantages of interchangeable assembly? (2M)
b. What is a collimator? Explain its working? (3M)
c. What is wringing ? Explain the procedure for wringing of slip gauges? (2M)
d. Difference between primary texture and secondary texture? (3M)
e. Discuss the various types of pitch errors along with their causes and effects? (2M)
f. Explain Tool Makers Microscope with neat sketch (3M)
g. Describe pitch measurement of internal and external screw threads by pitch measuring machine? (2M)
h. Define terms of a)Allowance b) Limits c) Tolerance d)fits? (3M)
i. Write short note on grades for specifying the surface texture? (2M)
j. Give the classification of slip gauges according to their accuracy? (3M)

PART B (50 MARKS)

2. Describe with a sketch the working principle of an autocollimator. What is meant by flatness? How is it measured with autocollimator? What are the uses of the instrument?

OR

3. i. Explicate i. position gauge ii. snap gauge with sketches. ii. Design and sketch a working gauge with a GO and NO-GO ends for spindle mm and a hole of mm.

4. i. Describe the working principle of tool markers microscope. What are its uses ii. Explicate the utility of straight edge and surface plate in laboratories.

OR

5. i) Enumerate various alignment tests on milling machine.
ii. Enumerate the various equipments and their essential precision and accuracy levels for performing alignment tests

6. Explain the manufacturing process, calibration , and uses of slip gauges

OR

7. Calculate CLA and RMS roughness values for the following date: Sampling length:20 mm, peaks : 40, 42, 40, 41, 42, valleys : 25, 22, 22, 24, 23.

8. Describe with the help of a neat sketch the working of "Gear tooth vernier caliper".

OR

9. Explain terms : Interchageablity and selective assembly. Enumerate the differences between them. ii. Determine and sketch the limits of tolerance and allowance for a 25 mm shaft and hole pair designated H8 - d9. The basic size lies in the range of 18-30mm. The multipliers for grades 8 and 9 are 25 and 40 respectively. The fundamental deviation for 'd' shaft is (-16D0.44) microns.

10. a) Taking an example, Explain the concept of limit gauging. What are its advantages and disadvantages?

b) What are angle gauges? Discuss their use in metrology lab?

OR

11. a) What are the elements of surface texture with neat diagram?

b) What are the advantages and limitations of stylus probe?

MALLAREDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

MECHANICAL DEPARTMENT **SUB: EMET**

MODEL PAPER 5

PART A (25 MARKS)

1. a. Explain about tolerance system with neat diagram (2M)
b. Define fit (3M)
c. Explain the construction and working of bevel protractor with neat diagram (2M)
d. State the advantages and possible sources of errors in CMM. (3M)
e. Define fit. (2M)
f. Explain optical flat types and its limitations (3M)
g. Define the principle of profilograph. (2M)
h. Explain the principle of Tool Makers microscope. (3M)
i. Explain the uses of limit gauges in mass production (2M)
j. Explain about the Primary Texture along with neat diagram (3M)

PART B (50 MARKS)

2. Define terms: Clearance; interference; allowance fit. Draw a conventional diagram for explicit representation of these terms on a shaft and hole pair.
ii. The hole and shaft assembly of 90 mm nominal size have tolerances specified as mm for shaft. Determine i. Maximum and minimum clearance (interference) attainable. ii. Allowance (iii) Hole and shaft tolerances (iv) Fundamental deviation (v) MML for shaft and hole (vi) Type of fit. Sketch these values on a conventional diagram.

OR

3. a) In the measurement of surface roughness, heights of 10 successive peaks and valleys were measured from a datum as follows

Peaks :	45	42	40	35	35	µm
Valleys:	30	25	25	24	18	µm

Determine the Rz value of the surface?

b) Write short note on grades for specifying the surface texture?

4. a)Taking an example, Explain the concept of limit gauging. What are its advantages and disadvantages?

b) What are angle gauges? Discuss their use in metrology lab?

OR

5. A hole and mating shaft are to have nominal and minimum assembly size of 50 mm. The assembly is to have a maximum clearance of 0.15mm and a minimum clearance of 0.05mm. The hole tolerance is 1.5 times the shaft tolerance. Determine the limits for both hole and shaft by using i) Hole basis system, ii)Shaft basis system.

6. a) Discuss the Principles of NPL flatness interferometer?

b) Explain how flatness errors of lapped surfaces are measured with an optical flat?

OR

7. a) Describe the working mechanism of dial indicator?

b) Advantages and disadvantages of dial indicators?

8. a) What is profilometer? Sketch and explain the use of profilometer?

b) Explain the symbols used to represent surface roughness?

OR

9. a) Explain the nomenclature of screw thread with the help of a neat sketch?

b) Discuss the various types of pitch errors along with their causes and effects?

10. i. Explicate the working principle of an Autocollimator. ii. Explicate the use of interferometer in measuring flatness of surfaces.

OR

11. a) What is the role of CMM?

b) Types of Coordinate Measuring machines?

c) What are the advantages & Applications of CMM?

MACHINE DESIGN - I QUESTIONS

UNIT I

SHORT ANSWERS

a) Define any four theories of failure.
b) Draw S-N Curve and mark all salient points.
c) What are the general considerations in designing a machine component?
d) Explain the modified Goodman diagram for torsional shear stresses.
e) What is Standardization? Give examples of Indian Standards for engineering materials.
f) Explain briefly about the causes of stress concentration.
g) Explain about the different types of fits.
h) Explain about static strength design based on fracture toughness.
i) Draw the S-N curve for ferrous and nonferrous components.
j) Discuss the factors influencing the selection of materials for machine elements.
k) Define the term stress concentration and What are the causes of stress concentration?
l) Enumerate the various phases of design.
m)) Explain preferred numbers and their significance.
n) Describe the causes of stress concentration.
o) Explain modified Goodman's line.
p) List the mechanical properties of materials.
q) Describe the methods to determine stress concentration factors.
r) Explain the endurance limit modifying factors.
s) Define fits and their significance.
t) Explain how the factor of safety is adopted in designing machine elements varies with the nature and type of load imposed on them.
u) Describe fatigue stress concentration factor.
v) Explain endurance strength and fatigue strength.
w) Enumerate the most commonly used Engineering materials.
x) What is the significance of preferred numbers?
y) Describe the stress concentration factor and its significance.

LONG ANSWERS

1. a) What are the general considerations in the design of machine elements?
   b) A cast iron pulley transmits 10 KW at 400 rpm. The diameter of the pulleys 1.2 meter and it has four straight arms of elliptical cross section. In which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15MPa.

C) Explain simple stresses

2. a) Explain Goodman failure .

b) A circular bar of 0.5 m length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5,size factor of 0.85, surface finish factor of 0.9. The material properties of bar is given by : Ultimate strength of 650 MPa, Yield strength of 500 MPa and Endurance strength of 350 MPa.

c) Draw S-N curve for mild steel and explain its significance.

b) Explain briefly the various theory of failures.

1. a) Explain the modified Goodman diagram for bending stresses.
   b) A transmission shaft of cold drawn steel 27Mn2 (S_{ut} = 500 N/mm^2 and, S_{yt} = 30N/mm^2) is subjected to a fluctuating torque which varies from -100 N-m to +400 N-m. The factor of safety is 2 and the expected reliability is 0%. Neglecting the effect of stress concentration, determine the diameter of the shaft. Assume the distortion energy theory of failure.
2. a) What are the manufacturing considerations in the design of Castings?
   b) A manufacturer is interested to start his business with five different models of tractors ranging from 7.5 to 75 KW capacities. Specify power capacities of models. There is an expansion plan to further increase the number of models from five to nine to fulfill the requirements of the farmers. Specify the power capacities of additional models.

3. a) Explain briefly about Soderberg and Goodman lines with neat sketches.
   b) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 KN and a maximum value of 50 KN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9.The material properties of bar are given by : Ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa.

4. a) Explain briefly about the preferred numbers.
   b) A cantilever cold drawn steel bar 20 mm diameter and 100 mm length is loaded by a transverse force of 0.55 kN, an axial load of 8 kN and a torque of 30 Nm. The yield tensile and compressive strength are 165 MPa and 190MPa.Compute factor of safety based on Maximum shear stress theory and Maximum distortion energy theory.

5. a) Draw the Gerber curve, Goodman and Soderberg lines with neat sketch and explain its significance.
   b) A solid circular shaft made of steel Fe620 (S_{ut} = 620 N/mm^2 and S_{yt} = 380 N/mm^2) is subjected to an alternating torsional moment, that varies from -200N-m to +400 N-m. The shaft is ground and the expected reliability is 90%. Neglecting the stress concentration, Calculate the shaft diameter for infinite life. The factor of safety is 2.Use the distortion energy theory of failure.

6. a) Explain briefly about the torsional and bending stresses in the design of machine elements.

b) A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10kN-m and a torsional moment of 30kN-m. Determine the diameter of shaft using all theories of failure and assuming a factor of safety of 2. Take E = 210 GPa and Poisson's ratio = 0.25.

7. a) Estimate the factors that affect the fatigue strength.
   b) A simply supported beam has a point load at the centre which fluctuates from a value F to 4F. Length of beam is 500 mm and cross section is circular with a diameter of 60 mm. Ultimate, yield stresses are 700 MPa and 500 MPa respectively. Endurance limit in reverse bending is 330 MPa. Factor of safety desired is 1.3.Assume size factor 0.83, Surface finish factor 0.9, reliability factor 1.0.Find the maximum value of F.

8. a) Explain the manufacturing considerations in design.
   b) State and explain various theories of failure under static loading.
   c) Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm^2. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa.

9. a) Explain the types of fluctuating stresses.
   b) A hot rolled steel shaft is subjected to a torsional moment that varies from +350 Nm to -115 Nm and an applied bending moment at a critical section varies from 445 Nm to 225 Nm. The shaft is of uniform cross section. Determine the required shaft diameter. The material has an ultimate strength of 550 MPa and yield strength of 410 MPa. Take the endurance limit as half the ultimate strength, factor of safety of 2, size factor of 0.85 and a surface finish factor of 0.62. (Using Goodman's Line).

10. a) What is the difference between caulking and fullering? Explain with the help of neat sketches.
    b) Design a triple riveted longitudinal double strap butt joint with unequal straps for a boiler. The inside diameter of the drum is 1.3 meters. The joint is to be designed for a steam pressure of 2.4 N/mm^2. The working stresses to be used are σ_t=77N/mm^2, τ=62 N/mm^2; σc=120 N/mm^2. Assume the efficiency of the joint as 81 %.

11. Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm^2. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa.

12. a) Explain the causes of stress concentration.
    b) A circular cross section cantilever beam having length 130 mm. subjected to a cyclic transverse load of varying form -150 N to 350 N, FOS is 2, theoretical stress concentration factor is 1.4, notch sensitivity factor is 0.9, ultimate strength is 540 MPa, yield strength is 320 MPa. Size correction factor is 0.85. Endurance limit is 275 MPa, surface correction factor is 0.9 and notch sensitivity factor is 0.9. Determine the diameter of the beam by (i) Goodman method and (ii) Soderberg method.

13. a) Discuss various theories of failure.
    b) Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm^2. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa.
14. a)) Explain the factors that affect the fatigue strength.
    b) A machine member is made of plain carbon steel of ultimate strength 650 N/mm^2 and endurance limit of 300 N/mm^2. The member is subjected to a fluctuating torsional moment which varies from -200 Nm to 400 Nm. Design the member using (i) modified Goodman's equation and (ii) Soderberg equation.

15. a) A shaft is required to transmit 1 MW power at 240 rpm. The shaft must not twist more than 1^o on a length of 15 diameters. If the modulus of rigidity for material of the shaft is 80 GPa, find the diameter of the shaft and shear stress induced.

    b) A bolt is subjected to a direct tensile load of 20 kN and a shear load of 15 kN. Suggest the suitable size of bolt according to various theories of elastic feature, if the yield stress in simple tension is 360 MPa. A factor of safety of 3.5 should be used. Take Poisson's ratio as 0.25.

16. a) Explain the factors that affect the fatigue strength.

    b) A machine member is made of plain carbon steel of ultimate strength 650 N/mm^2 and endurance limit of 300 N/mm^2. If the member is subjected to a fluctuating torsional moment which varies from -200 N-m to 400 N-m. Design the member using (i) modified Goodman's equation and (ii) Soderberg equation.

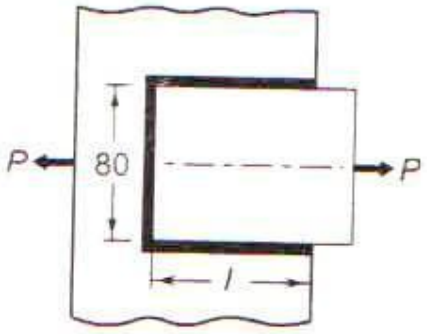
UNIT II

SHORT ANSWERS

a) How do you obtain a bolt of uniform strength?
b) Explain the various ways in which a riveted joint may fail.
c) Discuss about the bolts of uniform strength.
d) Discuss briefly about the bolts of uniform strength.
e) List out the various failures of the riveted joint and how do you classify the riveted joints.
f) Draw a sketch of triple riveted double cover butt joint with zig-zag type of riveting.
g) Explain the design procedure for eccentric loaded welded joints.
h) Differentiate the terms bolt, screw and stud.
i) List advantages of bolted joints over welded joints.

LONG ANSWERS

1. **a)** Explain briefly the design considerations of welded assemblies.
   b) How the strength of transverse fillet weld is evaluated?
   c) A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet weld, as shown below Fig. 1. The strength of the welded joint should be equal to the strength of the plate to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds.



2. a) Explain the design procedure for the eccentrically loaded bolted joint.
   b) Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm^2. Assume joint efficiency as 75 % , allowable tensile stress in the plate 90 MPa,compressive stress 140 MPa and shear stress in the rivet is 56 MPa

3. a) Explain briefly the design of welded joints subjected to twisting moment and the bending moment.

   b) A circular shaft, 75 mm in diameter, is welded to the support by means of a circumferential fillet weld. It is subjected to a torsional moment of 3000 N-m. Determine the size of the weld, if the maximum shear stress in the weld is not to exceed 70 N/mm^2.

4. a) What are the advantages and disadvantages of welded joints?
   b) A 65 mm diameter solid shaft is to be welded to a flat plate by a fillet weld around the circumference of the shaft. Determine the size of the weld if the torque on the shaft is 3 kNm and the allowable shear stress in the weld is 70 MPa.

5. a) A bolt is subjected to a direct tensile load of 20 kN and a shear load of 15 kN Suggest the suitable size of bolt according to various theories of elastic failure, if the yield stress in simple tension is 360 MPa. A factor of safety of 3.5 should be used. Take Poisson's ratio as 0.25.

6. a) Explain the bolts of uniform strength.

   b) A steam engine of effective diameter 300 mm is subjected to a steam pressure of 1.5 N/mm^2. The cylinder head is connected by 8 bolts having yield point 330 N/mm^2 and endurance limit at 240 N/mm^2. The bolts are tightened with an initial preload of 1.5 times the steam load. Assume a factor of safety 2. Find the size of bolt required the stiffness factor for copper gasket may be taken as 0.5.

7. a) Explain with sketches the different types of failures and efficiencies of the riveted joints.

   b) Two MS tie bars for a bridge structure are to be joined by means of a butt joint with double straps. The thickness of the tie bar is 12 mm and carries a load of 400 kN. Design the joint completely taking allowable stresses as 100 MPa in tension, 70 MPa in shear and 150 MPa in compression.

8. a) Discuss the advantages and disadvantages of riveted, bolted and welded joints.

   b) Design a cotter joint of socket and spigot type which is subjected to a pull and push of 50 kN. All the parts of the joint are made of the same material with the permissible stress as 70 MPa in tension, 100 MPa in compression and 40 MPa in shear.

9. a) Explain briefly design procedure for circumference lap joint for a boiler.
   b) Design a triple riveted longitudinal butt joint with unequal cover plates for a boiler seam. The diameter of the boiler is 2 m and the internal pressure is 2 MPa. The working stresses are 70 MPa in tension, 50 MPa in shear and 120 MPa in compression and the required efficiency of the joint is 80%.

UNIT III

SHORT ANSWERS

a) Draw split coupling.
b) Write the design procedure for muff coupling.
c) What are the differences between Rigid couplings and Flexible couplings?
d) How do you design the solid and hollow shafts based on strength and rigidity?
e) What are the requirements of a good Coupling?
f) What is the purpose of shaft coupling?

LONG ANSWERS

1. a) Briefly explain the procedure to design a shaft based on any two theories of failures.
   b) It is required to design a knuckle joint to connect circular shafts subjected to an axial force of 50 kN. The rods are coaxial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. The allowable tensile, compressive and shear stress in the rod and pin material is limited to 80MPa, 100MPa and 40MPa respectively.

2. a) Explain types of couplings.
   b) A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45MPa. Design a cast iron flange coupling. The shear stress in the coupling bolt is limited to 30MPa.

3. a) A shaft, 40 mm in diameter is transmitting 35 KW power at 300 rpm by means of Kennedy keys of 10X10 mm cross section. The keys are made of steel 45C8 (S_{yt} = S_{yc} = 380 N/mm^2) and the factor of safety is 3.Determine the required length of the keys.
   b) Design a sleeve and cotter joint to resist a tensile load of 60 KN. All parts of the joint are made of the same material with the following allowable stresses. σ_t = 60 MPa , τ = 70 MPa and σ_c =125 MPa.

4. a) Explain the design procedure for flexible coupling.
   b) Design a Cast Iron flange coupling for a steel shaft transmitting 15 KW at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25 % greater than the full load torque. The shear stress for Cast Iron is 14 MPa.

5. a) Explain briefly about the design of shafts subjected to combined bending and torsion.
   b) A line shaft is to transmit 30 KW at 160 rpm. It is driven by a motor placed directly under it by means of a belt running on a 1m diameter pulley keyed to the

end of the shaft. The tension in the tight side of the belt is 2.5 times that of the slack side and the centre of pulley overhangs 150 mm beyond the centre line of the end bearing. Determine the diameter of the shaft, if the allowable shear stress is 56MPa and the pulley weighs 1600 N.

6. a) Explain about the design of Bushed pin flexible coupling with a neat sketch.
   b) Design a Cast Iron flange coupling for a mild steel shaft transmitting 90 KW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1^0 in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa.

7. a) Explain the design procedure for Muff Coupling.
   b) Design a Cast Iron flange coupling for a mild steel shaft transmitting 90 KW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1^0 in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa.

8. a) Write the design procedure for a flexible coupling
   b) Design a Muff coupling which is used to connect two steel shafts transmitting 40 KW at 350 rpm. The material for the shaft and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40MPa and 80MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15MPa.

9. a) Compare weight, strength and stiffness of two shafts of same material, subjected to same torque. One being solid other being hollow with inner diameter to outer diameter ratio 0.5.
   b) Two shafts are connected by means of a flange coupling to transmit torque of 25 Nm. The two flanges of the coupling are fastened by four bolts of the same material at a radius of 30mm. Find the size of the bolts if the allowable shear stress for the bolt material is 30MPa.

10. Design and a cast iron coupling for a mild steel shaft transmitting 90kW at 250 rpm. The allowable shear stress in the shaft is 40MPa and the angle of twist is not to exceed 1^0 in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30MPa.

11. Design a rigid type of flange coupling to connect two shafts. The input shaft transmits 37.5kW power at 180 rpm to the output shaft through the coupling. The service factor for the application is 1.5. The design torque is 1.5times of rated torque. Select suitable materials for various parts of the coupling, design the coupling and specify the dimensions of the components.

12. Design a bushed pin type flexible coupling for connecting a motor shaft to a pump shaft for the following service conditions. Power to be transmitted = 40 kW, speed of the motor shaft = 1000 rpm. The material properties are : i) The

allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively, ii) allowable shear stress for cast iron is 15 MPa, iii) Allowable bearing pressure for rubber brush is 0.8 N/mm^2 and iv) the material of the pin is same as that of shaft and key. Draw neat sketch of the coupling.

UNIT IV

SHORT ANSWERS

a) Write notes on Types of keys.
b) Draw any three keys with neat sketches.
c) Explain briefly about the design of flat and square keys.
d) Explain briefly about the design of flat and square keys.
e) Explain the function of key and a cotter

LONG ANSWERS

1. a) Explain the design procedure for the socket and spigot joint.
   b) A circular steel bar 50 mm diameter and 200 mm long is welded perpendicularly to a steel plate to form a cantilever to be loaded with 5KN at the free end. Determine the size of the weld, assuming the allowable stress in the weld is 100 MPa.

2. a) Design a Knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.
   b) Explain briefly a design of shafts subjected to combined bending and torsion.

3. a) Write the design procedure for Jib and Cotter joint for square rods.
   b) A mild steel shaft transmits 20 KW at 200 rpm. It carries a central load of 900 N and is simply supported between the bearings 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. What size of the shaft will be required, if it is subjected to gradually applied loads?

4. a) Explain different types of keys.
   b) Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are $55N/mm^2$ in tension, $40N/mm^2$ in shear and 70 N/mm^2 in crushing. Draw a neat sketch of the joint.

5. a) Explain stresses acting on keys.
   b) Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are $55N/mm^2$ in tension, $40N/mm^2$ in shear and 70 N/mm^2 in crushing. Draw a neat sketch of the joint.

6. Two tie rods are to be connected by means of a sleeve and two steel cotters. The rods are subjected to a tensile load of 40kN. Design the joint using the permissible stress in tension as 60MPa, in shear as 50MPa and in crushing as 120MPa. Draw a neat sketch and show all the dimensions.

UNIT V

SHORT ANSWERS

a) What are the functions of springs?
b) Write briefly about the helical torsion springs with a neat sketch.
c) Explain briefly about the stresses and deflection in Coaxial springs.
d) Explain briefly about the stresses and deflection in helical compression springs.
e) How do you design the helical compression springs for fatigue loading?
f)) Discuss the stresses in Helical Springs of circular wire.
g) Explain the stresses in helical springs of circular wire.
h) Explain the construction of leaf spring.
i) What is nipping in a leaf spring? Discuss its role.

LONG ANSWERS

1. a) Explain co-axial springs.

b) A co-axial spring consists of two helical compression springs, one inside the other. The free length of the outer spring is 25 mm greater than the inner spring. The wire diameter and mean coil diameter of the inner spring are 8 mm and 64 mm respectively. Also the wire diameter and mean coil diameter of the outer spring are 10 mm and 80 mm respectively. The numbers of active coils in inner and outer springs are 10 and 15 respectively. Assume the same material for two springs and the modulus of rigidity of spring material is 81370 N/mm^2. Calculate

   a. The stiffness of the spring the deflection is from 0 to 25 mm.
   b. The stiffness of the spring the deflection is more than 25 mm.

2. a) Design a helical spring for a spring loaded safety valve for the following conditions: Diameter of valve seat = 65 mm, operating pressure = 0.7 N/mm^2, Maximum pressure when the valve blows off freely = 0.75 N/mm^2, Maximum lift of the valve when the pressure rises from 0.7 to 0.75 N/mm^2 = 3.5 mm, Maximum allowable stress = 550 MPa, Modulus of rigidity = 84 KN/mm^2, Spring index = 6.

   b) A truck spring has 12 number of leaves, two of which are full length leaves. The [6M] spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 KN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3.Also determine the deflection of the spring.

3. a) Explain the stresses and deflection in leaf springs with a neat sketch.

   b) A helical compression spring made of oil tempered carbon steel, is subjected to a load which varies from 400 N to 1000 N. The spring index is 6 and the design factor of safety is 1.25.If the yield stress in shear is 770 MPa and endurance stress in shear is 350MPa. Find: 1) Size of the spring wire 2) Diameters of the spring 3) Number of turns of the spring and 4) Free length of the spring. The compression of the spring at the maximum load is 30 mm. The modulus of rigidity for the spring material may be taken as 80 kN/mm^2.

4. a) Explain the construction of Multi leaf spring with a neat sketch.
   b) A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm^2.It is held on its seat by a closely coiled helical spring. The maximum lift of the sleeve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of the wire is limited to 500 MPa. The modulus of rigidity for the spring material is 80 KN/mm^3.Calculate: 1.Diameter of the spring wire 2.Mean diameter 3.Number of active turns and 4.Pitch of the coil.
      a. Take Wahl's factor = (4C – 1)/(4C-4) + 0.615/C, where C is the spring index.

5. a) Explain the design of helical compression springs with a neat sketch.
   b) A rail wagon of mass 20 tonnes is moving with a velocity of 2 m/s. It is brought to rest by two buffers with springs of 300 mm diameter. The maximum deflection of springs is 250 mm. The allowable shear stress in the spring material is 600 MPa. Design the springs for the buffers.

6. a) Describe the construction of semi-elliptical leaf spring.
   b) A helical compression spring made of oil tempered carbon steel is subjected to a load which varies from 400N to 1000N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770MPa and endurance stress in shear is 350MPa. Find i) Size of spring wire, ii) Diameters of the spring, iii) Number of turns of the spring, iv) free length of spring. The compression of the spring at the maximum load is 30mm. The modulus of rigidity for the spring material may be taken as $80kN/mm^2$.

7. A mechanism used in printing machinery consists of a tension spring assembled with a preload of 30N. The wire diameter of spring is 2mm with a spring index of 6. The spring has 18 active coils. The spring wire is hard drawn and oil tempered having the shear stress 680MPa and modulus of rigidity $80kN/mm^2$. Determine the initial torsional shear stress in the wire, spring rate and the force to cause the body of the spring to its yield strength.

8. A locomotive semi-elliptical laminated spring has an overall length 1m and sustains a load of 70kN at its centre. The spring has 3 full length leaves and 15 graduated leaves with central band of 100mm width. All the leaves are to be stressed to 400 MPa when fully loaded. The ratio of the total spring depth to that of width is 2. E= $210kN/mm^2$. Determine i) the thickness and width of the leaves, ii) The initial gap that should be provided between the full length and graduated leaves before the band load is applied and iii) The load exerted on the band after the spring is assembled.

9. Design a close coiled helical compression spring for a service load ranging from 2250N to 2750N. The axial deflection of the spring for the load range is 6mm.assume a spring index of 5.the permissible shear stress intensity is 420MPa and modulus of rigidity is $84kN/mm^2$. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring showing details of the finish of the end coils.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Managerial Economics and Financial Analysis

Time:3hours **Max Marks: 70**

Note: This question of 5 sections. Answer five questions, choosing one question from each section and each question paper contains carries 14 marks.

Section-I

1a) what is managerial economics? Discuss the nature & Scope of Managerial economics [6M]

b) What is demand forecasting? Explain various factors involved in demand forecasting. [6M]

c) Write a short note on Law of Demand. [2M]

OR

2 a) Define managerial economics. Illustrate how it helps in solving managerial problems. [7M]

b) Distinguish between micro and macro economics. [5M]

c) Define elasticity of demand. [2M]

Section-II

3 a) Explain the managerial uses of Production function. [7M]

b) Calculate the BEP in units and rupees using the following details: • Selling price per unit Rs. 100 • Variable cost per unit Rs. 60 • Fixed costs Rs. 20,000 • Actual sales Rs. 2,00,000 [7M]

OR

4a) Explain the Law of Variable proportions. [7M]

b) Describe Break-Even Point with the help of diagram and its uses in decision making [7M]

Section-III

a) What is Perfect Competition? Describe its features

5 [7M]

b) State the features merits and demerits of Sole Trade? [7M]

OR

OR

8 a) What is desalination of brackish water? Explain Reverse Osmosis and its significance.[4M]

b) Explain about break point chlorination [4M]

c)Explain Ion Exchange process with the help of a neat sketch. [6M]

Section-V

9 a) Explain the proximate analysis of coal with its significance. [7M]

b).Define petroleum.Explain refining of petroleum by fractional distillation [7M]

OR

10 a) Define cracking. Explain the process of fixed bed catalytic cracking with a neat sketch. [7M]

b) Define calorific value ,HCV,LCV. Explain the calorific value of gaseous fuel by Junkers gas calorimeter [7M]

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Engineering Chemistry

Time: 3 hours **Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1 a) Explain the construction and working of calomel electrode with neat sketch. [6M]

b) Explain the construction and working of Galvanic cell. [4M]
c) Define specific, molar and equivalent conductance. Give their units. [4M]

OR

2 a) Explain the construction and working of Lead-Acid storage cell with neat sketch [9M]

b) Explain the construction and working of H_2-O_2 fuel cell with neat sketch. [5M]

SECTION-II

3 a) What is electrochemical corrosion. Explain the mechanism of electrochemical corrosion by evolution of hydrogen and absorption of oxygen? [10M]
b) Define Galvanising, Tinning and Metal Cladding with examples. [4M]

OR

4 a) What is cathodic protection. Explain both sacrificial anodic protection and impressed current cathodic protection method? [14M]

SECTION-III

5 a) Explain the Zeolite process for softening of hard water? [9M]
b) Write a short note on Scales and Sludges. [5M]

OR

6 a) Explain the Reverse Osmosis and its significance. [4M]
b) Explain break point chlorination with a neat sketch. [5M]
c) Give a brief note on phosphate, calgon and colloidal conditioning. [5M]

SECTION-IV

7 a) Explain the proximate analysis of coal with its significance. [9M]
b) Explain the ultimate analysis of coal with respect to nitrogen. [5M]

OR

with a neat sketch. [8M] [3M] [3M]

[5M]

[9M]

[9M]

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Engineering Chemistry

Time: 3 hours **Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

Section-I

1 a) Explain the construction and working of Lead-Acid storage cell with neat sketch.[9M]

b) Explain the construction and working of H_2-O_2 fuel cell with neat sketch. [5M]

OR

2 a) Explain the construction and working of calomel electrode with neat sketch. [6M]
b) Explain the construction and working of Galvanic cell. [4M]
c) Define specific, molar and equivalent conductance. Give their units. [4M]

Section-II

3 a) what is cathodic protection. Explain both sacrificial anodic protection and impressed current cathodic protection method? [14M]

OR

4 a) what is electrochemical corrosion. Explain the mechanism of electrochemical corrosion by evolution of hydrogen and absorption of oxygen? [10M]
b) Define Galvanising, Tinning and Metal Cladding with examples. [4M]

Section-III

5 a) Explain the Reverse Osmosis and its significance. [4M]
b) Explain break point chlorination with a neat sketch. [5M]
c) Give a brief note on phosphate, calgon and colloidal conditioning. [5M]

OR

6 a) Explain the Zeolite process for softening of hard water? [9M]
b) Write a short note on Scales and Sludges. [5M]

Section-IV

7 a) Explain the proximate analysis of coal with its significance. [9M]
b) Explain the ultimate analysis of coal with respect to nitrogen. [5M]

OR

8a) Define cracking. Explain the process of fixed bed catalytic cracking with a neat sketch. [8M]
b) Define Calorific value, HCV and LCV of a fuel. [3M]
c) Give a brief note on octane and cetane number. [3M]

Section-V

9 a)What are conducting polymers. Explain the mechanism of conduction in polyacetylene? [9M]
b) write a short note on Biodegradable polymers. [5M]

OR

10 a) Difference between Addition polymerization and Condesation polymerization? [5M]
b) Explain the preparation, properties and applications of Bakelite, Teflon and polyethylene? [9M]

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)
UG Model question paper
Engineering Chemistry

Time: 3 hours Max Marks: 70

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

Answer all the questions

SECTION-I

1.a) Explain the construction of calomel electrode. [7M]
b) Define equivalent conductance and its unit. [2M]
c) Define galvanic series. [2M]
d) Explain galvanic cell. [3M]
OR

2.a) Explain the construction of hydrogen oxygen fuel cell. [7M]
b) Define secondary batteries with Lead acid cells. [4M]
c) Derive Nernst equation. [3M]

SECTION-II

3.a). Explain electrochemical corrosion. [7M]
b) Write about factors affecting rate of corrosion: [3M]
(i) Temperature (ii) Passivity (iii) Humidity
c) Write short notes on: [4M]
(i)Stable layer (ii) Unstable layer(iii) Volatile layer (iv) Porous layer
OR

4.a) Explain the process of galvanizing and tinning. [7M]
b) Describe the method of cathodic protection . [7M]

SECTION-III

5.a) Write a note on fabrication of plastics. [4M]
b) Define elastomers. Give the preparation and application of [4M]
(i) Buty rubber (ii) Buna-S
c) Define conducting polymer [2M]
d) Explain addition polymerization [3M]
OR

6.a) Explain the difference between thermoplastics & thermosetting plastics. [4M]
b) Outline the preparation properties and uses of [4M]
(i) Bakelite (ii) Nylon-6,6 (iii) PVC
c) Define condensation polymerization [2M]
d) Explain compounding of plastics [3M]

SECTION-IV

7. a) Explain break point chlorination. [4M]
b) Describe the lime soda process for softening of hard water. [4M]

c) Explain reverse osmosis [2M]

d) Write short note on: [3M]

(i)Scales (ii) Colloidal Conditioning (iii) Calgon Conditioning

OR

8.a) Explain softening of water by zeolite process. [4M]

b) Define caustic embrittlement with reaction. How can this be prevented? [4M]

c) Write short note on: [3M]

(i) Priming (ii) Phosphate Conditioning (iii) Sludge

d) Explain sterilization of water by chlorination. [2M]

SECTION-V

a) Describe the Fischer Tropsch s process of synthetic petrol. [5M]

9.b) Define cracking. Discuss any one' method of catalytic cracking. [5M]

c) Define octane number [4M]

OR

10. a) Explain knocking in internal combustion engine & prevention of knocking.[5M] b) Define petroleum. How is it refined by fractional distillation? Write various fractions with boiling range. [5M]

c) Define cetane number [4M]

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

UG Model question paper

Engineering Chemistry

Time: 3 hours **Max Marks: 70**

Note: This question paper contains of 5 sections. Answer five questions, choosing one question from each section and each question carries 14 marks.

SECTION-I

1 a) Write Nernst equation and give its applications. [3M]

b)Give a detailed account on the Lead Acid cell with appropriate chemical reactions.[6M]

c)Explain the construction and working of a Galvanic cell. [5M]

– OR

2 a) Explain the construction and functioning of H_2-O_2 fuel cell. Give the advantages and applications of fuel cells. [6M]

b)What is reference electrode. Explain the construction and working of Glass electrode. [6M]

c) What is an electrochemical series. Write two important applications. [2M]

SECTION-II

3 a)Explain rusting of iron with the help of electrochemical theory of corrosion. [7M]

b)Explain the processes ofGalvanising and Tinning. [7M]

OR

4 a)What is cathodic protection. Explain methods of cathodic protection. [6M]

b) Discuss how nature of metal and nature of environment affect the rate of corrosion [4M]

c) Explain Electroless plating. [4M]

SECTION-III

5 a) Differentiate thermoplatic resins and thermoset resins. [2M]

b)Write the preparation properties and applications of PVC,Teflon and Bakelite. [7M]

c)Give the characteristics of a good lubricant and explain flash and fire points. [5M]

OR

6 a)What are conducting polymers. Explain the mechanism of conduction in polyacetylene. [6M]

b)Explain vulcanization of rubber. Write the preparation, properties and applications of buns-S butyl rubber. [5M]

c) Distinguish between addition and condensation polymerization. [3M]

SECTION-IV

7 a)Write a note on caustic embrittlement, priming and foaming. [7M]

b)How municipal water is disinfected by chlorination and ozonisation.Explain breakpoint chlorination. [7M]

OR

8 a) Explain Zeolite process for softening of water.How exhausted zeolites are regenerated. [7M]

b) Explain how scales and sludges are formed in boilers.Write about Phosphate and Calgon conditioning for prevention of scales. [7M]

SECTION-V

9 a) Define HCV and LCV. [3M]

b) Explain ultimate analysis and give its significance. [6M]

c) Describe with a neat sketch the manufacturing of Fisher Tropsch s process. [5M]

OR

10 a) What is cracking. Explain in detail about fixed bed catalytic cracking with a neat sketch. [6M]

b) Give brief note on octane and cetane rating. [6M]

c)What are the characteristics of a good fuel. [2M]

III B.TECH I SEMISTER MECHANICAL ENGINEERING

MACHINE TOOLS MODEL QUESTION PAPER -1

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A (25 MARKS)

1. a) Discuss the variables affecting tool life? [2]

b) Explain requirement of tool materials? [3]

c) Discuss about attachment of lathe? [2]

d)What are the main parts capstan and turret lathe? [3]

e)List out the types of boring machine? [2]

f) List the advantages of shapers? [2]

g) Describe a milling cutter? [3]

h) Define honing process? [2]

i)What is the difference between rough grinding and precision grinding? [3]

PART-B (50 MARKS)

2.a) Describe basic requirements of machining?

b) Explain the construction of merchant force diagram?

(OR)

3.a) List out various tool materials and explain their applications?

b)Explain the use of chip breakers in metal cutting?

4.a)Explain the principal features of automatic lathes?

b) Discuss about the thread turning attachment on lathe?

(OR)

5.a)Differentiate between single spindle and multi spindle automatic lathes?

b)Discuss the working of various tool holding devices of lathe?

6.a)Explain various operations performed in drilling machine?

b)Sketch and explain the working of hydraulic drive of a horizontal shaper?

(OR)

7.a)What is the planner? Illustrate and describe its working principle?

b) Explain operation of vertical boring machine?

8.a)Sketch and describe a vertical milling machine?

b)List the product applications of lapping process?

(OR)

9.a)With the help of a neat diagram. explain the honing process?

b) Explain the factors to be considered while selecting a milling cutter?

10.a) Sketch and explain the three methods of external cylindrical centre less grinding?

b) Explain the different types of abrasives used in grinding wheel?

(OR)

11.a)Differentiate between traverse and plunge grinding?

b)Explain with neat sketch i) Centre less grinding ..ii) Internal grinding.

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III B.TECH I SEMISTER MECHANICAL ENGINEERING

MACHINE TOOLS MODEL QUESTION PAPER -2

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b,c as sub questions.

PART A (25 MARKS)

1.a) What are the causes of built up edge? [2]

b)What are the various types of single point cutting tools? [3]

c)Applications of lathe? [2]

d)What is the chucks? Differentiate between independent and universal holding chuck? [3]

e)What are the parts in planner machine? [2]

f) What are the specifications of drilling machine? [3]

g) What is tap? How the taps are Classified? [2]

h)What is the main difference between horizontal and vertical milling machine? [3]

i)What are the limitation of surface grinding? [3]

j)What is honing? [2]

PART-B (50 MARKS)

2.a) What are the various types of chips formed during machining ? under what conditions is each formed?

b) A carbide tool with mild steel work piece was found to give life of 2 hours while cutting at 0.50 mpm. Compute the tool life if the same tool is used at a speed of 25% higher than the previous one. Also determine the value of cutting speed if the tool is required to have tool life of 3 hours. Assume Taylors exponent n=0.27.

(OR)

3. What is tool signature ? with a neat diagram define varios angles in single point cutting tool geometry ?

4.a) Explain any three methods of taper turning on a lathe?

b)Differentiate between turret and capstan lathe machines state their applications?

(OR)

5.a) Classify different types of lathe .Explain any one in detail?

b)Explain about tool layout of automatic lathe with a neat sketch?

6.a) How is planner specified? Differentiate shaper, planner and slotting machine?

b)With a neat sketch explain construction and working of a planner?

(OR)

7.a) With a neat sketch explain construction and working of jig boring machine?

b) A hole of 50 mm and 75 mm depth is to be drilled in a mild steel component. The cutting speed can be taken as 65 mm and the feed rate as 0.25 mm rev. calculate the machining time and material removal rate?

8.a)State the various type of milling cutters .Explain any three of them?

b)Distinguish between simple, compound and differentiate indexing head?

(OR)

9.a) Compare the grinding with lapping and broaching process?

b)Give the kinematic scheme of lapping with neat diagrams?

10.a) Explain with a neat sketch the construction and working of tool and cuttergrinder?

b) State the advantages and limitations of centre less grinding?

(OR)

11.a) What are differentiate type of grinding machines? Draw and describe the surface grinding machine?

b) Mention the various types of bonds used in the making of grinding wheel. Also mention their applications/

III B.TECH I SEMISTER MECHANICAL ENGINEERING

MACHINE TOOLS MODEL QUESTION PAPER -3

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b, c as sub questions.

PART A (25 MARKS)

1.a)Differentiate ORS and ASA system? [2]

b)What are the types of chip breakers? [3]

c)Why are engine lathes called by that lathe? [2]

d)Define speed ,depth of cut and feed for plain turning operation? [3]

e)Classify and list of shapers and planners? [2]

f)Write short notes on the elements of drilling machine? [3]

g)What is reaming and counter bouring? [2]

h)What is jig boring? [3]

i)What are the merits and demerits of grinding? [2]

j)What are roll grinders and where are they used? [3]

PART-B (50 MARKS)

2.a)Explain the mechanism of chip formation in metal cutting with a neat sketch?

b) what is meant by built up edge? State the causes of it?

(OR)

3.a)Define cutting speed ,feed , and depth of cut with respect turning process , also state the units of measurements?

b)Describe basic elements of machining/

c)Explain briefly mechanics of chipformation?

4.a)What are the different operations performed on lathe explain briefly?

b)Explain about work holding devices and tool holding devices on lathe?

(OR)

5.a) Discuss the different operations that can be performed on turret and capstan lathe operations?

b)Write briefly about tooling layout of automatic lathes?

6.a) Explain construction and working of universal drilling machine with a neat sketch?

b)Describe the vertical boring machine. What they are performed and why?

(OR)

7.a) Describe the operation of quick return motion in mechanical shaper?

b)Explain the principal of planner and types of planner machine?

8.a) Name the various milling attachments? Explain universal milling with neat diagram ?

b)What is indexing ? describe direct indexing with example?

(OR)

9.a) Specify the honing parameters for good honing process?

b)Give advantages and limitations of honing and lapping?

c) Give the complete classifications of broaching machines?

10.a) Briefly describe about tool and cutter grinding machine?

b) Describe dressing and balancing in grinding requirement in grinding?

c)What are the advantages and limitations of using centre less grinding?

(OR)

11.a) How is abrasive is selected for grinding operation?

b) Specify different grinding machines?

c)Explain clearly the various thermal effects in grinding?

III B.TECH I SEMISTER MECHANICAL ENGINEERING

MACHINE TOOLS MODEL QUESTION PAPER -4

Note: This question paper contain two parts A and B..Part A is compulsory which carries 25 marks. Answer all question in part A. part B consists of 5 units. Answer any one full question from each unit. Each question carries 10 marks and may have a,b, c as sub questions.

PART A (25 MARKS)

1.a) What are the types of chips? [2]

b)What are the requirements of cutting tool? [3]

c)What are the parts of engine lathe? [2]

d)What is spinning? [2]

e)How is shaping machine specified? [3]

f)Explain the slotted link and gear mechanism? [2]

g)What are the different types of drills used? [3]

h)What is the difference between peripheral milling and face milling?[3]

i)What is a centre less internal grinder? [2]

j)What is grain, bond and structure? [3]

PART-B (50 MARKS)

2.a) Explain the methods for changing feed in gear boxes in detail with suitable sketches?

b)Draw the merchants circle diagram and derive the expressions to show the relationships among the different forces acting on the cutting tool and different parameters involved in metal cutting?

(OR)

3.Write short notes on the following

a) Chip breakers in single point cutting tools?

b) Advantages of negative rake angle?

c) Cutting speed and feed?

4.a) How do you classify turret lathes? Give a brief description of different types?

b)Write briefly about following holders used in capstan and turret lathes ?

i) Multiple cutter holder, ii)Drill tool holder

(OR)

5. a) How do you specify the lathe? What is the material used for lathe beds and explain the reasons for using such material?

b) Explain about box tool with a neat sketch. When it is used and what are its advantages?

6.a) Describe the various elements of a twist drill with a neat sketch?

b)What factors contributes to increased production rates in broaching?

(OR)

7.a) Define speed, feed, depth of cut and machining time in shaper with a neat sketch?

b)Define speed, feed, depth of cut and machining time in planner with a neat sketch?

8.a) Make a neat sketch of universal milling machine indicating the various controls and constructional features? Give brief description ?

b)Difference between up milling and down milling explain their applications/

(OR)

9.a) What is difference between compound indexing and differential indexing/

b)What are the various types of milling cutters and used in milling explain?

10.a) Describe grinding wheel structure with a neat sketch?

b)Compare grinding honing and lapping?

(OR)

11.a) What are the advantages and limitations of using centre less grinding?

b)Discuss various variables of grinding process?

c)What is grindability, sensitivity,Finishability and grinding ratio?