Mid Semester Examination, B. Tech. (Semester IV)
Course – (EEA2020) Electrical Technology
Department of Electrical Engineering

Maximum Marks: 25 **Credits: 03** **Duratio**

Answer all questions.
Assume suitable data if missing.
Notations and symbols used have their usual meaning.

No.	Question	
1.	Draw and explain the static I-V characteristics of an ideal SCR and a practical TRIAC. Describe latching current and holding current in brief.	
2.	Describe the operation of an uncontrolled full-wave bridge rectifier with R-load. Also, draw the waveforms for supply current, output voltage, load current, and the voltage across each switch.	(
3.	Briefly explain the operation of a single phase H-bridge Inverter connected with fixed RL load. If this inverter is being supplied with a 100 V battery, what will be the r.m.s. value of the output voltage?	(CO
4.	A half-wave rectifier has a source of 120 V rms at 50 Hz and an RL load with R =12 and L =12 mH. Determine (a) an expression for average value of the load voltage, (b) the value average current, (c) the power absorbed by the resistor. **OR** A dc chopper circuit (Buck converter) is supplied with power form an ideal battery of 100 V. The load voltage waveform consists of rectangular pulses of duration 1 ms in an overall cycle time of 2.5 ms. For resistive load of 20 Ω, calculate (a) the duty cycle, (b) the average output voltage (c) the r.m.s value of the output voltage, (d) the power absorbed by the load.	(C

B. Tech. IV- Semester (Mechanical Engineering)
Mid Sem. Examination 2021-2022
Course No. AM 2320

Time: 1 Hour

Note: Answer all questions MM:25

Q.1(a) Using Newton Raphson method, derive the iterative formula for finding the cube root of a positive number N and hence find the cube root of 12 correct to three places of decimal. [6] CO-1

OR

(a') (i) Show that the iterative scheme $x_{n+1} = \frac{1}{8}x_n\left(6 + \frac{3a}{x_n^2} - \frac{x_n^2}{a}\right)$ has third order convergence with the limit $\sqrt{a}$. [3+3] CO-1

(ii) The equation $x^2 + ax + b = 0$ has two real roots α and β. Show that the iterative scheme $x_{n+1} = -\frac{x_n^2+b}{a}$ is convergent near to α if $2|\alpha| < |\alpha + \beta|$.

(b) Solve the following system of equations by Gauss-elimination method with partial pivoting- [6] CO-1

$2x + y + 4z = 12$, $8x - 3y + 2z = 20$, $4x + 11y - z = 33$.

Q. 2(a) Using suitable interpolation formula, find y at $x = 8$ from the following data- [6] CO-2

(0,7), (5,10), (10,14), (15,18), (20,24), (25,32).

OR

(a') Derive Newton's divided difference formula and find the third divided difference With arguments a, b, c, d of the function $f(x) = \frac{1}{x}$

(b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.05$. Also find $\frac{dy}{dx}$ for $x = 1.22$ from the following table- [7] CO-2

x	1.00	1.05	1.10	1.15	1.20	1.25
y	1.000	1.0247	1.0488	1.0724	1.0954	1.1180

2b. Explain the followings with neat sketches and appropriate dimensions: [CO2] [3]

i. Unilateral system.
ii. Fundamental deviation.
iii. Allowance.

2c. Calculate the limits, tolerances, and allowance on a 25 mm shaft and hole pair designated H7/g6 to get a precision fit. [CO2] [4]

The following data is given:

(a) Upper deviation of shaft = $-2.5D^{0.34}$

(b) 25 mm falls in the diameter step of 18–30 mm

(c) IT7 = 16i

(d) IT6 = 10i

(e) Wear allowance = 10% of gauge tolerance In addition, determine the maximum and minimum clearance.

Or

Design the general type of GO and NO GO gauge for components having 30 H7/f8 fit. Given that; [CO2] [4]

(a) upper deviation of 'f' shaft = = $-5.5D^{0.41}$

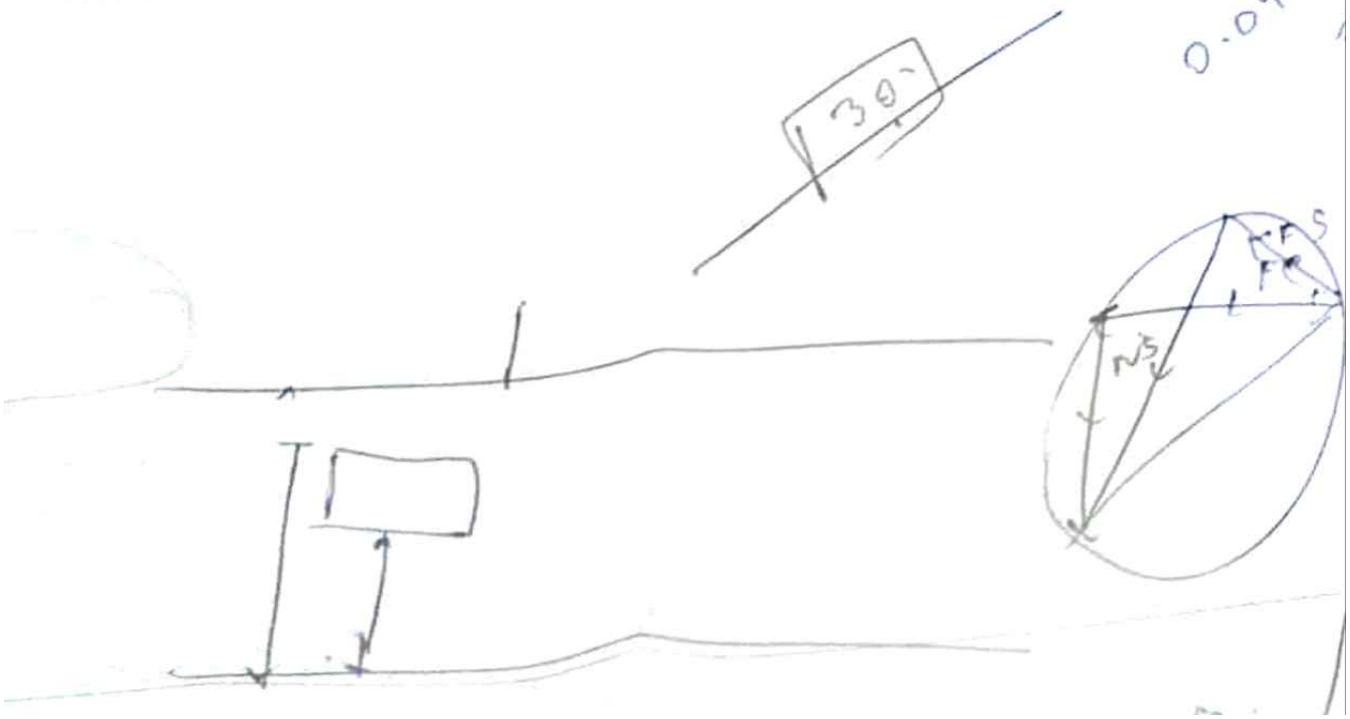
(b) 30 mm falls in the diameter step of 18–30mm

(c) IT7 = 16i

(d) IT8 = 25i

2d. A hole and a shaft of basic size of 30 mm and to have a clearance fit with maximum and minimum clearance to be 0.04 to 0.02 mm respectively. The hole tolerance is to be 1.5 times that shaft tolerance. Determine the limits for both hole and shaft using hole basis system. [CO2] [

**********END**********



2021-22
Mechanical Engineering department
Mid semester Examination
MEC2440, Manufacturing Technology II
Winter Semester

Time: One hour

M.M. =25

Q. No	Question	COs	Marks
1a.	While an orthogonal cutting, uncut chip thickness and chip thickness are observed to be 0.2 mm and 0.6 mm respectively. Calculate the cutting ratio.	[CO1]	[1]
1b.	In a 2-D turning operation, the cutting ratio is 0.6 while the effective rake angle is 11°, compute the shear angle. The work is rotating at a speed of 250 RPM	[CO1]	[2]
1c.	Various angles associated with a single point right hand turning tool are 12°, 15°, 7°, 0°, 0° and 8°. The nose radius is 0.5 inch. Rearranging the given data, give the signature of a tool, so that it can be employed for 2-D orthogonal turning operation. Keep the values of the relief angles to the minimum. Give the effective rake angle of the tool specified by you.	[CO1]	[2]
1d.	Following data is recorded while 2-D turning with the help of a right hand turning tool: Effective rake angle = 12° Shear angle = 25° Uncut chip thickness = 0. 4 mm Width of cut = 4.0 mm Chip thickness = 0. 9 mm Force along the cutting velocity = 350 N Force perpendicular to the cutting velocity = 400 N Average diameter of the rod = 60 mm Speed of the work piece = 250 RPM Compute shear strength of the work material. Or Calculate the energy consumed due to friction.	[CO1]	[4]
1e.	Using basic assumptions for 2-D cutting, prove the following: $2\emptyset + \lambda - \alpha = \frac{\pi}{2}$ Where ϕ, λ and α represent shear angle, friction angle and effective rake angle respectively of the cutting tool. Or While turning MS rod of diameter = 100 mm, it is observed that the cutting edge of the ceramic tool needs to be changed after cutting a length of 125 mm. Keeping the same RPM, if the diameter of rod = 25 mm cutting edge needs to be changed after cutting a length of 2000 mm. Compute the length of the rod machined between two consecutive cutting edge at same RPM if the diameter of the rod is 50 mm.	[CO1]	[4]
2a.	Differentiate between accuracy and precision of a machine tool with process capability curve.	[CO2]	[2]

2021-2022

Mid-semester Examination

B. Tech, Fourth Semester (Mechanical Engineering)

Paper – Materials Science

Paper Code - MEC2430

Max. Marks - 25

Duration - 1 Hour

Q1. Differentiate between [6], CO2

(a) Hardness and hot hardness

(b) Toughness and strength

(c) Grey cast iron and white cast iron

Q2. Explain the effect of any four alloying elements on properties of steel. [4], CO2

Q3. With the help of diagram, explain composition of a solid material illustrating crystals, unit cells, atoms and electrons in it. [5], CO1

Q4. Sketch the following planes and directions in cubical cells

(312), (211), (0 $\bar{1}$ 0), [1 1$\bar{1}$], [0 $\bar{1}$ 0] [5], CO1

OR

Q4'. Calculate the Miller indices of a plane passing through orthorhombic gallium crystal, and intersecting the three coordinate axes along a, b and c at 1.763, 8.040 and 1.915 Å respectively. Also show the plane in the unit cell.

The lattice constants for gallium are a = 3.526 Å, b = 4.020 Å and c = 7.660 Å. [5], CO1

Q5. Explain dislocation and its various movements in a material. [5], CO1

OR

Q5'. With the help of diagram, explain different types of point defects in ceramics. [5],CO1

EXAMINATION

MECHANICAL ENGINEERING

APPLIED THERMODYNAMICS (MEC2210)

Maximum Marks: 25

Duration: One hour

Answer the following questions. Use of thermodynamic tables and charts is allowed.

Q.No.		M.M.
1(a)	For an isothermal process, derive general expressions for Δu, Δh, and Δs for a gas which obeys the van der Waals equation of state.	[7] CO-1
	OR	
1(a')	Derive a relation for the Joule-Thomson coefficient and the inversion temperature for a gas whose equation of state is $(P + a/v^2)\, v = RT$	[7] CO-1
1(b)	Determine the specific volume of nitrogen gas at 10 MPa and 150 K based on a) the ideal-gas equation of state and b) the generalized compressibility chart Compare these results with the experimental value of 0.002388 m^3/kg, and determine the error involved in each case. (For Nitrogen, T_c = 126.2 K, P_c = 3.39 MPa)	[5.5] CO-1
2(a)	Derive the expression of thermal efficiency of air standard diesel cycle in terms of compression ratio, cutoff ratio and specific heat ratio.	[4] CO-3
2(b)	Discuss the Stirling engine with the help of p-v and T-s diagrams.	[3] CO-3
2(c)	A compression ignition engine working on diesel cycle. The overall compression ratio is 16 and heat addition at constant pressure continues for 11% of the stroke. The intake conditions are 1 bar and 25 °C and the engine operates with 12 m^3 of air per hour. Calculate the thermal efficiency and Power output.	[5.5 CO-
	OR	
2(c')	A gas turbine cycle has pressure ratio of 8 and a maximum cycle temperature of 600 °C. The ambient temperature is 25°C and air enters the compressor at a rate of 16 kg/s. The isentropic efficiencies of compressor and turbine are 85 % each. Calculate the power output and cycle efficiency.	[5. CO