20/11/19

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-20

Subject : Manufacturing Process I

Course: B.Tech (ME)

Time : 3 Hours

Full Marks : 70

Pass Marks: 28

- Candidates are required to give their answers in their own words as far as practicable.
- Question Paper is divided into **Three Parts –A,B& C**
- **Part-A** is compulsory.
- **Part- B** contains **SIX** questions out of which **FOUR** questions are to be answered.
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PART A

Q.1) **All questions are compulsory**

A] Multiple Choice Questions: **(10x1=10)**

a) Chances of crack propagation are more in
   i) Cold working process
   ii) Hot working process
   iii) Both (a) and (b)
   iv) None of the above

b) In extrusion process
   i) Metal is caused to flow through a restricted orifice
   ii) Metal is punched
   iii) Metal is pressed between the two rolls
   iv) None of the above

c) Castings are usually
   i) Cheaper than forgings
   ii) Costlier than forgings
   iii) At the same rate as forging for similar metal
   iv) None of the above

d) Specific gravity of plastics is usually
   i) Less than the specific gravity of metals
   ii) More than the specific gravity of metals
   iii) Similar to the specific gravity of metals
   iv) unpredictable

e) In rolling process

   i) Grains of metal gets elongated and volume of metal increases
   ii) Grains of metal becomes large in dimension and volume remains same
   iii) Grains of metals gets elongated whereas volume remains same
   iv) Can't be determined

f) In Taylor's tool life equation the term T represent

i) Tool life
ii) Time of cutting
iii) Temperature during cutting
iv) None of the above

g) 'mm/revolution' is the unit of

i) feed
ii) depth of cut
iii) width of cut
iv) rotational speed

h) Sprue, riser and pouring basin are the parts of
i) Gating system
ii) Vents
iii) Punching
iv) Blanking

i) The angle made in shear plane in metal cutting operation is called
i) Shear angle
ii) Shear force angle
iii) Shear break angle
iv) None of the above

j) The minimum and maximum pressure required to operate in Water Jet machining is
i) 100 MPa, 2000 MPa
ii) 400 MPa, 1400 MPa
iii) 100 Pa, 2000 Pa
iv) 400 MPa, 1400 Pa

B] Very Short question

a) Define shear plane angle.
b) Define rack angle.
c) What is the function of core?
d) What is forming?
e) What is extrusion?

(5x2=10)

PART B

Q2. Answer any four: **(4x5=20)**

i) What is the purpose of gating system?
ii) Discuss welding defects.
iii) Discuss the relation of velocities in orthogonal cutting.
iv) Discuss the rolling process of metals.
v) Explain working principle of Water Jet Machining
vi) Explain the purpose of using non-traditional machining process.

PART C

Answer any three: **(3x10=30)**

Q. 3) Make a brief summary of relationship between various angles and forces as per Merchant's analysis of metal cutting.

Q.4) Explain various types of chips with neat sketch.

Q.5) Differentiate between:

a. Blanking and punching with neat sketches.
b. Hot and cold extrusion with neat sketches.

Q.6) What is oxyacetylene welding? Explain types of flames with neat sketches.

Q.7) In Taylor's tool life exponent n = 0.3 and constant C = 400, What will be the percentage increase in tool life be when cutting speed is reduced to half.

Q.8) The following data have been observed for an orthogonal cutting test.
Depth of cut = 1.5 mm, width of cut = 5 mm, rack angle = 15°, cutting speed = 25 m/ min, chip thickness ratio = 0.4, shear stress = 150 N/ mm^2.

Find shear angle, friction angle, chip flow speed and shear force.

23/11/19

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-22

Subject: B.Tech ME

Course:- Mech. Ki Of Machinery

Time : 3 Hours

Full Marks: 70

Pass Marks: 28

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Part A

Q-1)All questions are compulsory

A] Multiple Choice Questions: **(10X1=10)**

i. A cam & follower forms a
   a) Lower pair
   b) Higher pair
   c) Screw pair
   d) None of them

ii. The relation between the number of link and number of pair is
   a) L=2p-1
   b) L=2p-3
   c) L=2p-4
   d) L=3p-2

iii. A ball and socket joint is a
   a) Sliding pair
   b) Turning pair
   c) Rolling pair
   d) Spherical pair

iv. The bolt and nut form a
   a) Sliding pair
   b) Rolling pair
   c) Screw pair
   d) Turning pair

v. The cam follower used in automobile engine is
   a) Roller
   b) Flat - faced
   c) Spherical – faced
   d) Knife – edged

vi. Module of a gear is defined as
   a) D/T
   b)T/D
   c)T X D
   d) None

vii. An imaginary circle which by pure rolling action gives the same motion as the actual gear is a called
a) Addendum Circle
b) Duodenum Circle
c) Pitch Circle
d) Clearance Circle

viii. The size of the cam depends on
a) Base Circle
b) Pitch Circle
c) Prime circle
d) Pitch Curve

ix. For low and moderate speed engines the cam follower should move with
a) Uniform Velocity
b) Simple Harmonic Motion
c) Uniform Acceleration And Retardation
d) Cycloidal Motion

x. Due to slip of belt the velocity ratio of belt drive
a) decreases
b) increases
c) does not change
d) none

iii) Return during next 60 of cam rotation

B] Very short answer question **(5X2=10)**

a) Define a kinematic pair and differentiate between a sliding pair and turning pair.
b) Show that an arrangement of four bar link is a kinematic chain.
c) Define in a gear - addendum circle, circular pitch and pressure angle.
d) Derive an expression for velocity ratio in a belt drive in terms of the diameter neglecting slip and belt thickness.
e) Name the various types of follower in a cam.

Part B

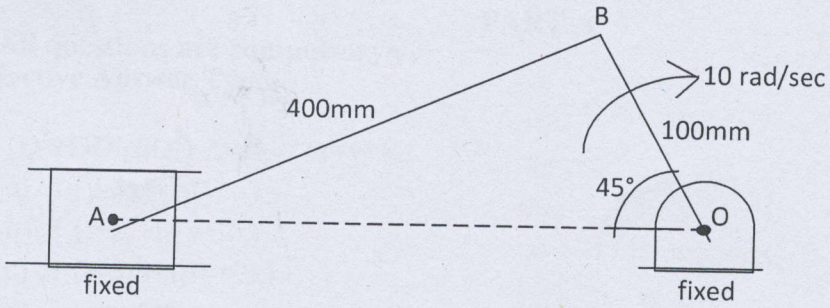
Q-2) Answer any four questions **(4X5=20)**

a. How are the kinematic pairs classified? Explain with diagram giving examples.
b. What is meant by Inversion of a mechanism and how do we find the number of Inversions? Explain with a four bar mechanism.
c. Differentiate between mechanism and machine, lower and higher pair, turning and rolling pair.
d. Define pitch circle, trace point, pitch point, pitch curve and pressure angle with a neat diagram for a gear.
e. State law of gearing and with a suitable diagram proves the same.
f. In a cam with knife edge follower draw the displacement, velocity and acceleration diagram when follower moves with uniform velocity.

Part C

Answer any three questions **(3X10=30)**

Q-3) Locate all the instantaneous centers of a slider crane mechanism. The length of crank OB=100mm and connecting rod AB= 400mm. The crank rotates in clockwise direction with an angular velocity of 10 rad/sec. Find the velocity of slider A and angular velocity of connecting rod AB.



Q-4) Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft. The follower moves with a uniform velocity during both out stroke and return stroke for a knife follower of camrotation

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-20

Subject: Mathematics-3

Course: B tech

Time : 3 Hours

Full Marks: 70

Pass Marks: 28

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- **Part- C** contains **SIX** questions out of which **THREE** questions are to be answered.
- **Part-D** is compulsory

PART A

Q1.) All questions are compulsory:-

A] Objective Answer Type **(5x1=5)**

i) $(D^2+DD'-6D^2)\ Z=\cos(2x+y)$ be

a) $f_1(y-3x)+f_2(y+x)$

b) $f_1(y-x)+f_2(y+2x)$

c) $f_1(y-3x)+f_2(y+2x)$

d) none of these

ii) One dimensional heat flow equation is given by

a) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$

b) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial t^2}$

c) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial y^2}$

d) None of these

iii) One dimentional wave equation is given by

a) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial y^2}$

b) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

c) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial t^2}$

d) None of these

iv)) One of the methods to find out mode is

a) Mode = 2median-3mean

b) Mode = 3median-2mean

c) Mode = 3median-2mean

d) None of these

iv)) standard deviation is calculated on the basis of

a) mean

b) median

c) mode

d) None of these

B] Short Answer Type **(5x2=10)**

i) What do you mean by range?
ii) What is meant by skewness? How is it measured?
iii) Find the C.F of $(D^3-2D^2D')z=2e^{2x}$
iv) Two cards are drawn in succession from a pack of 52 cards find the chance that first is a king and second is a queen
v) If the probability of new born child is a male is 0.6 .find the probability that in family of 5 children there are exactly 3 boys?
vi) Define exponential distribution?

PART B

Q2.) Answer any four: **(4x5=20)**

a) A random variable X has an exponential distribution function with pdf is given by f(x)

i. $F(x)=\begin{cases}2e^{-2x} & when\ x>0\\ 0 & when\ x\le 0\end{cases}$

b) Compute the probability that X is not less than 3 also find mean and standard deviation.
c) The probability that a bomb dropped from a plane will strike the target is 1/5. If the six bombs are dropped. Find the probability that (i) exactly two will strike the target (ii) at least two will strike the target ?
d) **In a** bolt factory machine A,B,and C ,manufactured 25%, 35% and 40% of the total of their output 5%,4% and 2% are defective bolts. A bolt is drawn at random from the product and is found to be defective. What are the probabilities that it was manufactured by machine A?
e) form the partial differential equation by eliminating the arbitrary function from a $z=f(x^2-y^2)$
f) solve $py^3+qx^2=0$ by the method of separation of variables
g) Solve $\frac{\partial^3 z}{\partial x^2 \partial y}=\cos(2x+3y)$ by direct integration method?

PART C

Answer any Three: **(3x10=30)**

a) Form the partial differential equation by eliminating the arbitrary function of $F(x+y+z, x^2+y^2+z^2)$
b) Using the method of separation of variables, solve $\frac{\partial u}{\partial x}=2\frac{\partial u}{\partial t}+u$ where $u(x,0)=6e^{-3}$
c) solve $(x^2-y^2-z^2)p+2xyp=2xz$
d) Solve $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ where c^2 is constant of diffusivity of material subject to the condition
e) $U(0,t)=u(l,t)=0$ and $u(x,0)=f(x)$ at $t=0$
f) **A tightly** stretched string with fixed end points x=0 and x=L in the shape defined by y=kx(l-x)
g) Where k is constant is released from position of rest find y(x,t) of the vertical displacement

if $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$?

Q8.) Calculate the coefficient of correlation between birth rate and death rate from the following data:

Birth rate:	24	26	32	33	35	30
Death rate:	15	20	22	24	27	24

PART D

i) **Q9.)** From the following data compute arithmetic mean

Marks:	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No of students:	8	10	12	20	11	4	5

(5x1=5)

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-20

Subject : THERMODYNAMICS

Course: B.Tech (Mech. Engg.)

Time : 3 Hours

Full Marks : 70

Pass Marks: 28

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PART A

I. All questions are compulsory:-

A] Objective Answer Type
(10x1=10)

i) Carnot cycle consists of.....
a) Two constant volume and two reversible adiabatic processes
b) Two isothermal and two reversible adiabatic processes
c) Two constant pressure and two reversible adiabatic processes
d) One constant volume, one constant pressure and two reversible adiabatic processes

ii) Which of the following laws is applicable for the behaviour of perfect gas .....
a) Boyle's law
b) Charle's law
c) Gas-Lussac law
d) All of the above

iii) The amount of heat absorbed to evaporate 1 kg of water from its saturation temperature,without change of temperature, is called.....
a) Sensible heat of water
b) Latent heat of vaporisation
c) Enthalpy of steam
d) Entropy of steam

iv) Characteristic gas constant of a gas is equal to.....
a) C_p/C_v
b) C_v/C_p
c) C_p-C_v
d) C_p+C

v) Zeroth law of thermodynamics.....
a) Deals with conversion of mass and energy
b) Deals with reversibility and irresibility of process
c) States that if two system are both in equilibrium with a third system, they are in thermal equilibrium with each other
d) Deals with heat engines

vi) Work done in a free expansion process is
   a) zero
   b) minimum
   c) maximum
   d) positive

vii) If the value of $n = 0$ in the equation $pv^n = C$, then the process is called
   a) constant volume process
   b) adiabatic process
   c) constant pressure process
   d) isothermal process

viii) Which of the following is correct?
   a) Absolute pressure = Gauge pressure + Atmospheric pressure
   b) Gauge pressure = Absolute pressure + Atmospheric pressure
   c) Atmospheric pressure = Absolute pressure + Gauge pressure
   d) Absolute pressure = Gauge pressure - Atmospheric pressure

ix) The statement that energy can be neither created nor destroyed but only converted from one form to another, is known as
   a) Kinetic theory of gases
   b) Zeroth law of thermodynamics
   c) First law of thermodynamics
   d) Second law of thermodynamics

x) A series of operations, which takes place in a certain order and restore the initial conditions at the end, is known as
   a) reversible cycle
   b) irreversible cycle
   c) thermodynamic cycle
   d) none of these

B] Short Answer Type **(5x2=10)**

i) Derive the expression for work done during isothermal process?
ii) What do you understand by dryness fraction?
iii) Draw the Carnot cycle on T-s diagram?
iv) What is thermodynamic system?
v) State the zeroth law of thermodynamics.

PART B

II. Answer any four: **(4x5=20)**

i) Define COP. Show that $COP_{HP}=COP_{REF}+1$.
ii) What is Carnot cycle? What are the four processes that constitute this cycle?
iii) Draw a neat sketch (schematic) of a steam power plant showing the basic components.
iv) Derive an expression for work done during polytropic process.
v) Derive an expression for heat transfer during Isobaric process.

vi) State the 2nd law of thermodynamics. What do you understand by heat engine, heat pump and refrigerator?

PART C

III. Answer any Three: 3x10=30)

1. A 3 kg mass of a gas enclosed in a cylinder-piston assembly is allowed to expand in accordance with $PV^{1.2}$=constant whereupon its initial state 0.22 m^3/500 kPa changes to final pressure of 100 kPa. Assuming the expansion to be quasi-static, calculate Q, ΔU, and W. Given that the specific internal energy changes in accordance with

$$u = 3.56\,PV + 84$$

2. A gas (volume = 0.014 m^3) expands polytropically from a pressure of 2.07 MPa to 207 kPa. The polytrophic exponent n=1.35. Determine the work done by the gas during the expansion.

3. A certain mass of gas in a closed system is undergoing polytrophic expansion in accordance with the expression PV^n = constant. It takes Q_{1-2} amount of heat in the course of its change of state from 1 to 2. Show that

$$Q_{1-2} = [(\gamma-n)/(\gamma-1)] \times \text{polytropic work done}$$

4. A steam chest holds 500 kg steam at 10 bar. Steam quality is 90% dryness. Determine

   a) its enthalpy b) its entropy

   c) how much heat is to be added to make it 100% dry

5. A steam power plant operates ideally in the simple ideal Rankine cycle. Steam (3MPa/623K) enters the turbine and after expansion is exhausted to a total condenser operating at a pressure 75 kPa. Determine the thermal efficiency of this cycle.

6. A reversible heat engine is hooked up with three thermal energy reservoirs: 600 K, 300 K, and 200 K. It takes up 3200 kW heat from the reservoir at 600 K and produces the mechanical work output of 1800 kW. Determine the heat interaction of other TERs with the heat engine.

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-20

Subject : Material Science

Time : 3 Hours

Course: B.Tech (ME)
Full Marks : 70
Pass Marks: 28

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PART A

Q.1) **All questions are compulsory**

A] Multiple Choice Questions : **(10x1=10)**

a) Addition of magnesium to cast iron increase its
   i) Hardness
   ii) Corrosion resistance
   iii) Creep strength
   iv) Ductility and strength in tension

b) Most ductile materials are
   i) Lead
   ii) Tin
   iii) Aluminium
   iv) Silver

c) Strain hardening improves
   i) Static Tensile strength
   ii) Steady state creep rate
   iii) Fatigue life
   iv) None of these

d) Crystal structure of metals is studied by
   i) Metallographic technique
   ii) X-ray technique
   iii) Ultrasonic method
   iv) Electron microscopy

e) The 136° angle between the two faces of indenter is used in
   i) Vickers hardness test apparatus
   ii) Brinell hardness test apparatus
   iii) Rockwell hardness test apparatus
   iv) None of these

f) The terms sintering is associated with
   i) Welding technique
   ii) Die casting technique
   iii) Powder metallurgy technique
   iv) Soldering technique

g) Annealing is done
   i) to harden the surface
   ii) for surface smoothness
   iii) for relieving stresses
   iv) for improving microstructure for good surface finish.

h) If a is the lattice parameter of a bcc crystal, the distance between two nearest neighbours is
   i) $\sqrt{3}/2a$
   ii) 2a
   iii) $2/\sqrt{3}a$
   iv) $\sqrt{3}a$

i) Which of the following is magnetic allotrope of iron?
   i) α-iron
   ii) γ-iron
   iii) β-iron
   iv) δ-iron

j) Steel can be hardened quickly by the process of
   i) Induction hardening
   ii) Nitriding
   iii) Cyaniding
   iv) Carburizing

B] Very Short question **(5x2=10)**

a) Name different types of heat treatment process.
b) Explain Toughness of a metal.
c) What is nucleation?
d) What is the purpose of heat treatment?
e) Define hardness.

PART B

Q2. Answer any four: **(4x5=20)**

a) Distinguish between ductile and brittle fracture.
b) What is solid solution? Explain its type.
c) Write short notes on vickers hardness test.
d) Write short notes on Annealing and normalizing.
e) What is phase diagram? Draw the binary phase diagram.
f) Write down short notes on h.c.p. structure.

PART C

Answer any three: **(3x10=30)**

Q. 3)

a. What do you understand by plastic deformation? Show the plastic deformation curve on stress-strain diagram.
b. Explain the difference between annealing and normalizing in detail.

Q.4)

a. Explain the recovery, recrystallization and grain growth in detail.
b. Explain Iron-Carbon diagram in details.

Q.5)

a. Name the different types of crystallographic structures in materials. Explain any two.
b. Write down the classification of crystal imperfections in details.

Q.6)

a. Explain various types of hardness test.
b. What is the significance of tensile test?

Q.7)

a. What do you understand by NDT testing? Explain any two of it.
b. How NDT is different from hardness test? Explain.

Q.8)

a. Draw stress-strain curve and explain its various points.
b. In the equation $\sigma = K\varepsilon^n$, which represents the true stress-strain curve for a material, what is the significance of the exponent n?

ARKA JAIN University, Jharkhand

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