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END SEMESTER EXAMINATION, JANUARY-2018
PROGRAM: DIPLOMA (ME) THIRD SEMESTER

COURSE CODE : DMET203**COURSE TITLE : STRENGTH OF MATERIALS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****(2 x 10 = 20)****Q. 1.** Attempt **all** questions.

- a. State hooks law.
- b. i. Change in length of a bar of is uniform cross section is given by $\delta L =$ _____
 ii. Unit of modulus of elasticity is _____
- c. Write formula for parallel axis theorem related to moment of inertia.
- d. Define the section modulus.
- e. Give the answer for following in short.
 - i. Bending moment is maximum at a point?
 - ii. The point at which BM is zero is called?
- f. Draw types of loads.
- g. Define principle planes.
- h. Bending equation is given as _____
- i. The value shear stress increases along _____ of the shaft.
- j. Differentiate between short column and long column.

Section (B)**(7 x 5 = 35)****Q. 2.** Attempt **any 5** questions.

- a. A circular bar 2.5 m long tapers uniformly from 25 mm diameter to 12 mm diameter. Determine extension rod under a pull of 30 kN. Take E for bar as 200 GPa.
- b. Write a short notes on:
 - i. Resilience
 - ii. Proof resilience
 - iii. Modulus of resilience.
- c. Find the deflection of beam at the free end subjected to point load at the free end with help of Moment area method.
- d. A rectangular beam 300 mm deep is simply supported over a span of 4 meters. What UDL load the beam may carry, if the bending stress is not to exceed 120 MPa .Take $I = 225 \times 106 \text{ mm}^4$.
- e. Find the diameter of the shaft required to transmit 60 KW at 150 rpm if the maximum shear stress of 60 N/mm².
- f. Find the centre of gravity of a T-section along with flange 750 mm X 100 mm and web also 450 mm x 100 mm.
- g. At a point in a stressed element, the normal stresses in two mutually perpendicular directions are 45 MPa and 25 MPa both tensile and anticlockwise direction shear stress of 15 MPa, determine the Maximum and minimum principle stress with their direction.

Section (C)**(15 x 3 = 45)**Attempt **any 3** questions.**Q.3.** Prove the relation:

$$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L} ?$$

(15)**Q.4.** a. Following data refers to a tensile test conducted on a mild steel bar.

- i. Diameter of the steel bar = 50mm;
- ii. gauge length= 250 mm; (iii) Extension at load 100KN= 0.149mm
- iii. Load at yield= 280 KN;

iv. Maximum load= 400 kN;

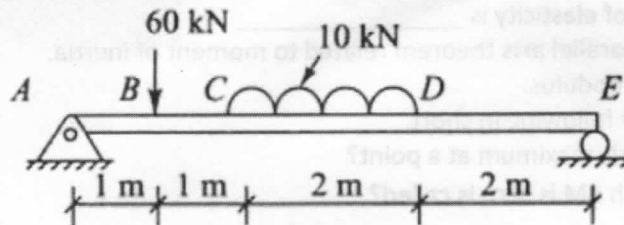
v. Total extension=56mm

Calculate: (i) Young's modulus (ii) yield stress (iii) Ultimate strength (iv) percentage elongation. (7)

b. Define following Mechanical properties: (8)

- Ductility
- Brittleness
- Malleability
- Hardness

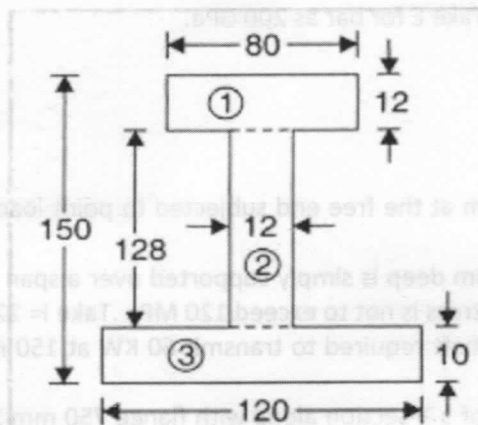
Q5. Draw shear force and bending moment Diagram for following beam. (15)



Q.6. a. Write the assumptions used in the **Pure Bending Theory**. (6)

b. A hollow cast iron column of 150 mm external diameter and 100 mm internal diameter is 3.5 m long. If one end of the column is rigidly fixed and other is free, find the critical load on the column. Assume modulus of elasticity (E) for the column material as 120 GPa. (9)

Q.7. Determine the polar moment of inertia ($I_{zz} = I_{xx} + I_{yy}$) of I section shown in figure. All dimensions are in mm. (15)



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END SEMESTER EXAMINATION, JANUARY-2018
PROGRAM: DIPLOMA (ME) THIRD SEMESTER

COURSE CODE : DMET202**COURSE TITLE: FLUID MECHANICS AND HYDRAULIC MACHINES****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & questions.

Section (A)

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Define viscosity?
- b. Define specific weight?
- c. Define specific gravity of a liquid?
- d. Define surface tension?
- e. Define Bernoulli's principle.
- f. What do you understand by pressure head?
- g. What do you understand by laminar flow?
- h. What is the application of venturimeter?
- i. What is the application of Pitot tube?
- j. Why the reaction turbine is called reaction turbine?

Section (B)

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. A circular plate of diameter 1.5m is placed vertically in water in such a way that the center of the plate is 3m below the free surface of water. Determine: (i) Total pressure on the plate. (ii) Position of the center of pressure
- b. Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9 the base of the plate coincides with the free oil surface.
- c. Explain the working principle of reaction turbine and construction and working of Francis Turbine.
- d. Explain the construction and working of Hydraulic power plant.
- e. Derive the relation for Pascal's law.
- f. The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The center of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm ?
- g. Explain and draw a hydraulic accumulator?

Section (C)

Attempt any 3 questions.

(15 x 3 = 45)

- Q.3.** (a) The diameters of a pipe at the inlet and outlet are 200mm and 300mm respectively. If the velocity of water flowing through the pipe at inlet is 4m/s, find (i) Discharge through the pipe, (ii) Velocity of water at outlet.

(5)

- (b) A pipe (1) 450mm in diameter branches into two pipes (2 and 3) of diameters 300mm and 200mm respectively as shown in Fig.1. If the average velocity in 450mm diameter pipe is 3m/s find: (i) Discharge through 450mm diameter pipe; (ii) Velocity in 200mm diameter pipe if the average velocity in 300mm pipe is 2.5m/s. (10)

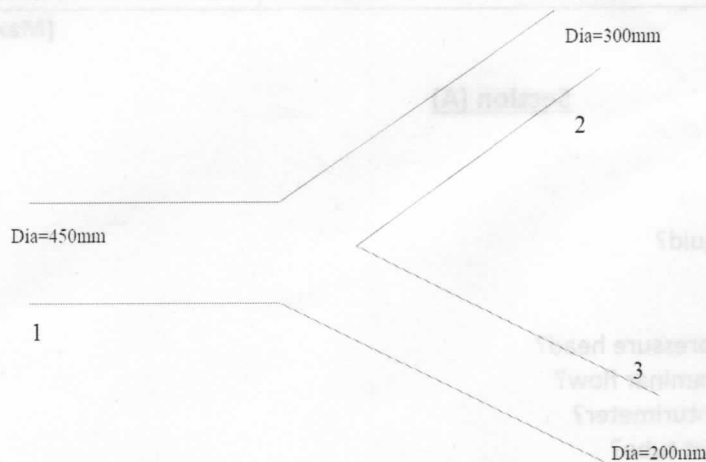


Fig.1

- Q.4. (a). Explain the following term for turbine (i) hydraulic efficiency, (ii) Volumetric efficiency, (iii) Mechanical efficiency, (iv) overall efficiency (8)
- (b). A Pelton wheel is to be designed for the following specifications (i) power (brake /shaft) =9560 KW ,(ii) Head = 300 m ,(iii) speed =750 rpm,(iv) overall efficiency =85%,(v) jet diameter is 1/6 of wheel diameter the determine the following (i) wheel diameter, (ii) Jet diameter, (iii) number of jet required. (7)
- Q.5. (a) Explain the construction and working of Pelton wheel turbine with suitable diagram. (8)
- (b) What is the difference between inward and out ward flow reaction turbine? (7)
- Q.6. (a) A horizontal venturimeter with inlet diameter 200mm and throat diameter 100mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180mm of mercury. If the co-efficient of discharge is 0.98 determine the rate of flow. (9)
- (b) Explain - (i) single column manometer, (ii) Differential manometer (6)
- Q.7. Explain the construction and working of centrifugal pump with suitable diagram, and also explain the individual component of the centrifugal pump. (15)

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END SEMESTER EXAMINATION, JANUARY-2018**PROGRAM : DIPLOMA(ME) THIRD SEMESTER****COURSE CODE : DMET206****COURSE TITLE : MECHANICAL MEASUREMENT & METEOROLOGY****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****Q. 1. Attempt all questions.****(2 x 10 = 20)**

- a. What do you mean by sensors?
- b. Explain transducer?
- c. What do you mean by barometer?
- d. Write short notes on thermocouple?
- e. What do you mean by error?
- f. Explain tolerance with its types?
- g. Define fits with its types?
- h. Explain V block?
- i. What is feeler gauge?
- j. What do you mean by pitch diameter in screw threads?

Section (B)**Q. 2. Attempt any 5 questions.****(7 x 5 = 35)**

- a. Define error and explain the sources of error?
- b. Explain peltier, Thomson and seebeck effect?
- c. Explain epicyclic gear transmission dynamometer with proper diagram?
- d. Explain all the terminology of Limits, Fits and Tolerance?
- e. Explain any 5 terminology of screw threads and draw a detail diagram of screw thread?
- f. What do you mean by bonded gauge and give a detail notes on its types?
- g. Explain unbounded strain gauge by constructing its neat sketch?

Section (C)**Attempt any 3 questions.****(15 x 3 = 45)**

- Q. 3.
 - a. What do you mean by measurement and explain the general characteristics of measurement system by drawing its block diagram?
 - b. Define sensors and transducer explaining each of their types?
- Q. 4.
 - a. Explain the concept of Bourden gauge and McLeod gauge with proper sketch?
 - b. Draw a neat sketch of Dead weight piston gauge, manometer and barometer and explain each of them.
- Q. 5.
 - a. Write a short notes on Tachometers and define its types?
 - b. Explain the concept of Prony Brake transmission Dynamometer and draw its diagram?
- Q. 6.
 - a. Calculate all the relevant dimensions of 35H7/f8 fit, dimension 35 mm falls in the step of 30-50 mm. The fundamental deviation for 'f' shaft is $-5.5D^{0.41}$ where i is in microns $=0.45(D)^{1/3}+0.001D$, IT7=16i and IT8=25i.
 - b. Determine the tolerances on the hole and the shaft for a precision running fit designated by 50 H7g6, given; 50 mm lies between 30-50 mm, i (in microns) $=0.45(D)^{1/3}+0.001D$, Fundamental deviation for 'H' hole=0. Fundamental deviation for g shaft $=-2.5D^{0.34}$, IT7=16i and IT6=10i. State the actual maximum and minimum sizes of the hole and shaft and maximum and minimum clearances.
- Q. 7.
 - a. Explain sine bar and bevel protractor with proper diagram?
 - b. Explain Tool maker's microscope and construct its diagram?

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END SEMESTER EXAMINATION, JANUARY-2018**PROGRAM : DIPLOMA(ME) THIRD SEMESTER****COURSE CODE : DMET204****COURSE TITLE : THERMAL ENGINEERING-I****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. Convert 1atmospheric pressure into S.I. unit.
- b. Define system, surrounding and boundary.
- c. State the different thermodynamic processes.
- d. What is the unit of specific heat in S.I. unit?
- e. Define specific heat in thermodynamics.
- f. What is irreversible process?
- g. Explain heat and work energy.
- h. What is the value of gas constant for air?
- i. State and explain all terms related to universal gas equation.
- j. Explain enthalpy and state its equation.

Section (B)**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. Explain paddle wheel work and free expansion process in detail.
- b. Explain the Carnot engine cycle with diagram.
- c. Explain heat engine and heat pump stating relation for their efficiency.
- d. Derive the work done relation for isothermal process.
- e. Explain all the three laws related with ideal gas and draw their diagram.
- f. Explain the various non flow processes.
- g. Calculate the C.O.P of a heat pump when it is giving heat to a room at 27°C and ambient temperature is 210 Kelvin.

Section (C)

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. Explain (i) intensive and extensive properties and (ii) microscopic and macroscopic properties? (7.5)
 - b. Explain thermodynamic equilibrium in detail? (7.5)
- Q. 4.**
 - a. Explain adiabatic and polytropic process in detail? (7.5)
 - b. At 30°C, one mole of an ideal gas occupy a volume .The gas is isentropically expanded to a volume twice the initial volume and the temperature falls to 20°. Calculate the ratio of initial to final pressure? (7.5)
- Q. 5.**
 - a. State and explain Clausis statement and Kelvin Planck statement? (7.5)
 - b. Calculate the temperature of carbon dioxide (CO₂) when the pressure of the gas is 2 bar. Density is 3.0kg/m³ and the specific gas constant is 0.2969 kJ/Kg K? (7.5)
- Q. 6.**
 - a. A vessel of cylindrical shape of diameter 60 cm and height 80 cm contains 5 kg of gas. The manometer indicates 620 mm of Hg. Determine the (i) absolute pressure of gas and (ii) specific volume and density of the gas? (7.5)
 - b. A tank containing air is stirred by a paddle wheel. The work input to paddle wheel is 9000J and heat transfers to surrounding tank is 3000J. Calculate the work done and also state the limitation of first law of thermodynamics? (7.5)
- Q. 7.**
 - a. Explain T-Q and formation of steam diagram in detail? (7.5)
 - b. Explain the two statements of second law of thermodynamics related to Heat engine and Heat pump? (7.5)

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END SEMESTER EXAMINATION, JANUARY-2018
PROGRAM : DIPLOMA (ME) THIRD SEMESTER

COURSE CODE : DMET205**COURSE TITLE : ENGINEERING MATERIALS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. What is crystal lattice? Define unit cell.
- b. What is thermal conductivity?
- c. Define ferrite and austenite.
- d. How is thermal shock of materials related to thermal conductivity and coefficient of thermal expansion?
- e. What is quenching? List some of the quenching medium.
- f. Define creep. With examples
- g. What is meant by normalizing? State its purpose.
- h. Why ceramic materials are usually bad conductor?
- i. Name any two copper alloys? Write their composition.
- j. What are composites?

Section (B)**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. What is meant by "heat treatment"? Write its purpose.
- b. What is corrosion? Explain its types.
- c. What is meant by hardenability? What are the factors affecting it?
- d. Define tempering. Explain its types.
- e. Discuss the properties and uses of aluminum.
- f. Explain briefly nano-materials.
- g. Define plastics. Explain its classification.

Section (C)

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. What do you understand by "material science" and "engineering materials"? How is the study of material science useful to an engineer? (7.5)
 - b. Define atomic factor. Obtain expression for SC, FCC and BCC. (7.5)
- Q. 4.**
 - a. Draw Iron-Carbide equilibrium diagram and mark on it all salient temperature and composition fields. (7.5)
 - b. What is an alloy steel? How are alloy steel classified? (7.5)
- Q. 5.**
 - a. Explain:
(i) Full Annealing (ii) Spheroidising (iii) Hardening (7.5)
 - b. What are austempering and martempering? What are their purpose? (7.5)
- Q. 6.**
 - a. List the various non-ferrous metals. Describe the characteristics and applications of any three. (7.5)
 - b. What are the different bearing metals and explain their properties. (7.5)
- Q. 7.**
 - a. Explain ceramics materials, their characteristics and applications. (7.5)
 - b. Define properties and applications of rubber, mica, paints, enamels and wood. (7.5)

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END SEMESTER EXAMINATION, JANUARY-2018
PROGRAM : DIPLOMA(ME) FIFTH SEMESTER

COURSE CODE : DEET303*

COURSE TITLE : ELECTRICAL MACHINES AND CONTROLS

[Time allotted: Three hours]

[Max. Marks: 100]

Note: Attempt all Sections & Questions.

Section (A)

(2 x 10 = 20)

Q. 1. Attempt all questions.

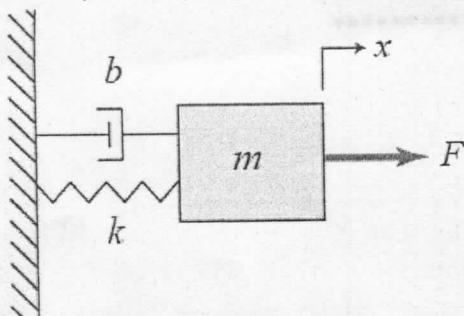
- Write the well-defined formulae for self and mutually induced emf equation of a transformer.
- Draw the star-star connections of a three phase transformer.
- Draw the block diagram for electro-mechanical energy conversion in a dc motor.
- Draw the circuit diagram for long shunt compound dc generator.
- Write the well-defined formula for synchronous speed of a three phase induction motor.
- List the various parts of a three phase synchronous motor.
- Draw the symbol of a dashpot element and write its mathematical relation.
- Write one advantage of each open loop and closed loop control system.
- Draw the unit impulse function and write its mathematical relation.
- Define maximum overshoot.

Section (B)

(7 x 5 = 35)

Q. 2. Attempt any 5 questions.

- Derive the expression for power transferred inductively and conductively in an autotransformer.
- Explain the function of compensating windings and interpoles in a dc machine.
- Explain the working of a three phase induction motor.
- Write the system equation for the given mechanical system.



- Determine the stability of a control system with the given characteristic equation.

$$s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 8 = 0$$
- Draw the circuits for step up and step down autotransformer.
- Explain the flux control method used to control the speed of a dc motor.

Section (C)

(15 x 3 = 45)

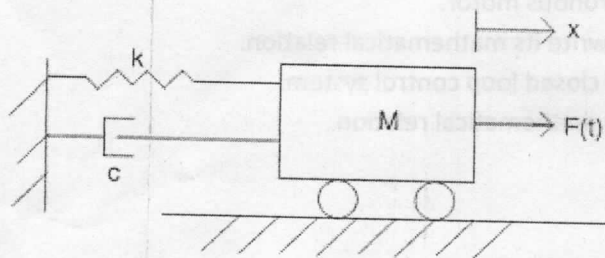
Attempt any 3 questions.

- Derive the emf equation of a transformer. (7.5)
- In a step down autotransformer the supply voltage is 440 V. The voltage across a 30 Ω load resistance is 300 V. Draw the complete circuit diagram for the given autotransformer with currents through all the parts. (7.5)

- Q. 4. a. Explain the various losses in a dc machine. (7.5)
 b. A 100 KW, 240 V shunt generator has a field resistance of 55Ω and armature resistance of 0.067Ω . Find the full load generated voltage. (7.5)

- Q. 5. a. Derive the expression for rotor current frequency in three phase induction motor. (7.5)
 b. A 3 phase 50 Hz induction motor has 8 poles. If the full load slip is 2.5 %. Determine: (7.5)
 i. Synchronous speed
 ii. Rotor speed
 iii. Rotor frequency

- Q. 6. a. Draw the block diagram of an open loop and closed loop control system. (7.5)
 b. Draw the free body diagram and write the system equations for the given mechanical system: (7.5)



- Q.7. a. Derive the expression for maximum overshoot of a second order control system. (7.5)
 b. The forward path transfer function of a unity feedback control system is given by;
 $G(s) = \frac{2}{s(s+2)}$
 Obtain an expression for unit step response of the system. (7.5)

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END SEMESTER EXAMINATIONS, JANUARY-2018
PROGRAM : POLYTECHNIC (ME) FIFTH SEMESTER

COURSE CODE: DMET 301

COURSE TITLE: MANUFACTURING TECHNOLOGY II

[Time allotted: Three hours]

[Max. Marks: 100]

Note: Attempt all Sections & Questions.

Section (A)

Q. 1. Attempt all questions.

(2 x 10 = 20)

- a. What are the functions of runner and riser in sand casting?
- b. How is fluidity defined in casting?
- c. What is the main difference between live center and dead center?
- d. What do you mean by swing of lathe?
- e. Describe the role of cutting fluids in machining.
- f. What happens if pouring time in casting is too high or too low?
- g. How will you express 'grade' and 'structure' of a grinding wheel?
- h. Mention the electrodes that are used in EDM and ECM process.
- i. Which materials are used in the manufacture of grinding wheels and what are their applications?
- j. Give the applications of ECM.

Section (B)

Q. 2. Attempt any 5 questions.

(7 x 5 = 35)

- a. Describe the features of gating system with neat sketch.
- b. What are the various operations can be performed on a lathe?
- c. How unconventional machining processes are classified? What is the need of advanced machining?
- d. What are the differences between capstan lathe and turret lathe?
- e. Describe honing method of finishing operation.
- f. Define the drilling operation. Classify the different types of drills used.
- g. State the merits of the EBM and LBM processes.

Section (C)

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3. a. Describe centrifugal casting with neat sketches. Write its salient features and limitations. (7.5)
b. Briefly explain various casting defects. (7.5)
- Q. 4. a. What is turning? Describe its capabilities. (7.5)
b. Derive an expression for the determination of shear angle in orthogonal metal cutting. (7.5)
- Q. 5. a. Explain surface grinding process. Explain three different ways in which wear of grinding wheel takes place. (7.5)
b. Sketch and indicate the important parts of a column and knee type milling machine. (7.5)
- Q. 6. a. Explain the principle of broaching. Sketch different types of broaches. (7.5)
b. Discuss the types and properties of moulding sand. (7.5)
- Q. 7. a. With a neat sketch explain the working principle of electron beam machining and write the advantages. (7.5)
b. Describe various types of operations performed on drilling machine after making a hole. (7.5)

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END SEMESTER EXAMINATIONS, JANUARY-2018**PROGRAM : DIPLOMA (ME) FIFTH SEMESTER****COURSE CODE : DMEAT301****COURSE TITLE : AUTOMOBILE TECHNOLOGY****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. Name the various components used in CB point ignition system.
- b. List the various components of transmission system?
- c. Number of cylinders in Tata Nano is two. (Yes/no)
- d. When the gear ratio through the transmission is 1:1.15, the transmission is in _____ (over drive/direct drive/under drive/neutral)
- e. Arrange in correct sequence the path of force transmission from the steering wheel to the front wheel steering system; Steering knuckle, arm drag link, steering wheel, steering gear box, steering column, ball joint, front wheel and tie rod end
- f. State the function of clutch.
- g. What is meant by dumb iron in frame construction?
- h. What do you know about over drive?
- i. Write three types of steering gears.
- j. Which refrigeration cycle is mostly used in car air conditioning system?

Section (B)**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. What are the benefits of synchromesh gear box used in cars?
- b. What is the function of differentials used automobile?
- c. Define set back and thrust angle with the help of sketch.
- d. Explain the working of solenoid switch used in starter motor.
- e. Explain the working of wiper motor assembly.
- f. Explain the working of tandem master cylinder.
- g. What is the requirement of good braking system?

Section (C)

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3. a. Derive the condition of correct steering (7.5)
b. Explain the working and construction of leaf springs. (7.5)
- Q. 4. a. What do you understand by steering ratio? (5)
b. Explain the working of steering gear as used in Maruti Swift car. Illustrate your answer with a neat sketch. (10)
- Q. 5. a. Explain with suitable sketch the operational features of sliding mesh gear box? (10)
b. What are the disadvantages of this type of gear box? (5)
- Q. 6. a. What is the requirement of ignition system used in multi cylinder cars? Explain the function of condenser used in ignition system. (7.5)
b. Explain the working of distributor used in ignition system? (7.5)
- Q. 7. a. Explain the basic components used in Multi point fuel injection system? (7.5)
b. What are various components of car air conditioning system? (7.5)

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END SEMESTER EXAMINATIONS, JANUARY-2018**PROGRAM : DIPLOMA(ME) FIFTH SEMESTER****COURSE CODE : DMEPT 301****COURSE TITLE : PRODUCTION TECHNOLOGY-II****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**Section (A)****Q. 1. Attempt all questions.****(2 x 10 = 20)**

- a. What is the meaning of Zero defect in SQC?
- b. Name the types of solid lasers and gas lasers.
- c. Why is Kerosene used as slurry in EDM process?
- d. Explain Taylor's tool life.
- e. What do you mean by Plastics?
- f. Write short notes on natural and synthetic organic polymers.
- g. What is the role of stripper plate on Die Assembly?
- h. What is the full form of JIT and explain any one of its waste?
- i. Write the difference between standard and special purpose machine tool.
- j. Write short notes on internal center less grinding.

Section (B)**Q. 2. Attempt any 5 questions.****(7 x 5 = 35)**

- a. What are polymers? Explain natural and synthetic polymers and write a short note on linear, branched and network chain polymers?
- b. Draw a neat sketch of Single Point Cutting Tool.
- c. Explain clearance angle, Lip angle and Nose radius on cutting tool.
- d. Describe injection molding with neat sketch.
- e. Explain Laser Beam machining with neat sketch and write its advantages, disadvantages and applications.
- f. Explain semi-automatic lathes and automatic lathes on production machine tools.
- g. What is lathe machine? Describe the various part of a lathe machine.

Section (C)**Attempt any 3 questions.****(15 x 3 = 45)**

- Q. 3.
 - a. Explain abrasion, adhesion and diffusion wear in single point cutting tool.
 - b. Explain hydraulic copying system on lathe machine.
- Q. 4.
 - a. Write the differences between thermoplastics and thermosetting plastics.
 - b. Define blow molding and explain its types.
- Q. 5.
 - a. Express the EDM process with neat sketch and explain its MRR equation.
 - b. Express the ECM process with neat sketch and write its advantages, disadvantages and its applications.
- Q. 6.
 - a. During orthogonal machining with an HSS Tool, the rake angle was 8° , the undeformed chip thickness was 0.15mm and width of cut was 3mm. Assuming shear strength of work material to be 450N/mm² and coefficient of friction to be 0.9, estimate cutting and thrust force.
 - b. A carbide cutting tool when machined with mild steel work piece material at a cutting speed of 90m/min lasted for 180 minutes. Determine the life of the tool when cutting speed is increased by 65%. At what speed the tool is to be used to get a tool life of 180 minutes? Assume $n=0.26$ in the Taylor expression.
- Q.7.
 - a. What do you mean press tool? Explain blanking, piercing, progressive and compound tool ?
 - b. What do you mean by process control and SQC? Write the objectives of SQC and advantages of SQC.

Enrol. No. S R H U

Regn. No. D D

END SEMESTER EXAMINATIONS, JANUARY-2018

PROGRAM: DIPLOMA(ME)

FIFTH SEMESTER

COURSE CODE : DMET302

COURSE TITLE : DESIGN OF MACHINE ELEMENTS

[Time allotted: Three hours]

[Max. Marks: 100]

Note: Attempt all Sections & Questions.

Section (A)

Q. 1. Attempt all questions.

(2 x 10 = 20)

- What is Concurrent Engineering?
- What is an interference fit? Give examples.
- Define thermal stress and residual stress.
- What are the methods of reducing stress concentration? Explain with suitable diagrams.
- Define pitch, transverse pitch & diagonal pitch in riveted joint.
- What is fillet? Why is shaft provided with fillet radius?
- What is bolt of uniform strength?
- What is key? What are the functions of key?
- What is the objective of nipping of a leaf spring?
- What is the function of a brake?

Section (B)

Q. 2. Attempt any 5 questions.

(7 x 5 = 35)

- A manufacturer is interested in starting a business with five different models of tractors ranging from 7.5 kW to 75 kW capacities. Specify power capacities of the models. There is an expansion plan to further increase the number of models from five to ten to fulfill the requirements of farmers. Specify the power capacities of the additional models.
- Find the extreme diameters of shaft and hole for the fit 20H6-s5. What is the type of fit between hole and shaft? Also, calculate the maximum & minimum value on corresponding type of fit.
- A round shaft made of a brittle material and subjected to a bending moment of 15 N-m is shown in Fig. 1. The stress concentration factor at the fillet is 1.5 and the ultimate tensile strength of the shaft material is 200 N/mm². Determine the diameter 'd' and magnitude of stress at the fillet. Also, find the FOS.
- Two plates are fastened by means of two bolts as shown in Fig. 2. The bolts are made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 5. Determine the size of the bolts if $P = 5 \text{ kN}$.
- A plate, 100 mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds as shown in Fig. 3. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 70 and 50 N/mm² respectively. Find the length of each parallel fillet weld. Assume the tensile force acting on plates as static.
- A multi-disk clutch consists of steel and bronze plates. It transmits 15 kW power at 1400 rpm. The inner and outer diameters of the contacting surfaces are 100 mm and 200 mm respectively. The coefficient of friction is 0.15 and the permissible intensity of the pressure is 0.5 N/mm². Assuming uniform wear theory, calculate the number of steel and bronze disks.
- Define spring. What are the functions of spring? Explain active and inactive coils in springs.

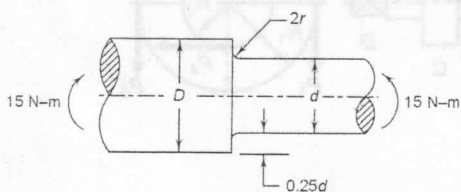


Fig. 1

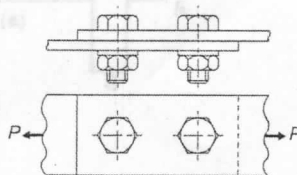


Fig. 2

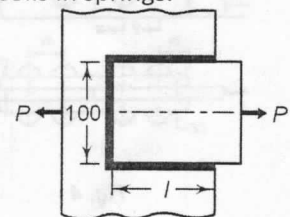


Fig. 3

Section (C)

(15 x 3 = 45)

Attempt **any 3** questions.

Q.3. Write the design procedure for cotter joint.

Q.4. Two flat plates subjected to a tensile force P are connected together by means of double-strap butt joint as shown in Fig. 4. The force P is 300 kN and the width of the plate w is 250 mm. The rivets and plates are made of the same steel and the permissible stresses in tension, compression and shear are 80, 110 and 70 N/mm² respectively. Calculate:

- The diameter of the rivets.
- The thickness of the plates.
- The dimensions of the seam, viz., p , p_t and m .
- The efficiency of the joint.

Q.5. A car has a total mass of 900 kg. The moment of inertia of each wheel about transverse axis through its centre of gravity is 0.5 kg-m². The rolling radius of wheel is 0.25 m. The rotating and reciprocating parts of the engine and the transmission system are equivalent to a moment of inertia 2.5 kg-m², which rotates at five times the road wheel speed. The car is travelling at a speed of 90 km/h on plane road. When the brakes are applied on rear wheels of car, it decelerates at 0.6 g. Calculate the

- The energy absorbed by each brake.
- The torque capacity of each brake.

Q.6. The layout of a transmission shaft carrying two pulleys B and C supported on bearings A and B as shown in Fig. 5. Power is supplied to the shaft by means of vertical shaft on the pulley B, which is then transmitted to the pulley C carrying a horizontal belt. The maximum tension in the belt on the pulley B is 3.5 kN. The angle of wrap for both the pulleys is 180° and the coefficient of friction is 0.24. The shaft is made of plain carbon steel 30C8 ($S_{yt} = 400$ N/mm²) and the factor of safety is 4. Determine the shaft diameter on strength basis.

Q.7. A helical compression spring, made of circular wire, is subjected to an axial force, which varies from 2.5 kN to 3.5 kN. Over this range of force, the deflection of the spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and grounded ends. The spring is made of patented and cold drawn steel wire with ultimate tensile strength of 1050 N/mm² and modulus of rigidity of 81370 N/mm². The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate:

- Wire diameter.
- Mean coil diameter.
- Number of active coils.
- Total number of coils.
- Free length of the spring.
- Solid length of the spring.
- Required spring rate.
- Actual spring rate.

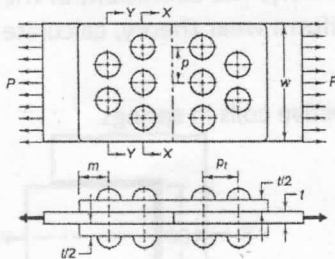


Fig. 4

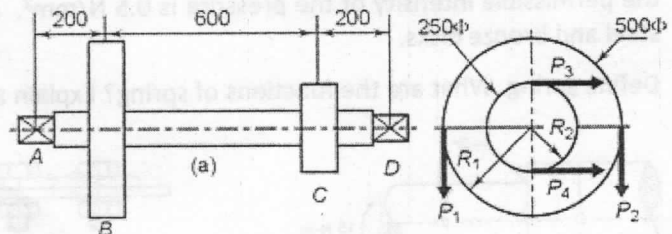


Fig. 5

Enrol. No. S R H U

Regn. No. D D

END SEMESTER EXAMINATIONS, JUNE - 2018
PROGRAM : POLYTECHNIC **SECOND SEMESTER**

COURSE CODE : DMCT105**COURSE TITLE : BASIC MECHANICAL AND CIVIL ENGINEERING****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Mention any two advantages of gear drive?
- b. What do you understand by capital energy?
- c. What do you understand by renewable energy?
- d. Give any two advantages of hot working?
- e. What do you understand by brazing?
- f. Write the purpose of taper roller bearing.
- g. What do you mean by foundation?
- h. Write the purpose of frog in the brick
- i. Write use of first class brick.
- j. Define liquid and gaseous waste.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. Explain the principle and working of tidal energy power generation.
- b. Explain the working of 4-stroke petrol engine with suitable diagram.
- c. What do you understand by fasteners, explain the rope drive with suitable diagram?
- d. What is the application of key; describe the various types of keys with suitable diagram.
- e. Explain the following
 - i. Heart wood ii. Size of brick iii. Concrete iv. Tread and riser v. Sap wood vi. Pith vii. Annular rings
- f. Explain sedimentary, igneous, metamorphic rocks with examples.
- g. Write classification of roads. What is coarse and fine aggregate, bitumen and tar?

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. Explain the construction and working of nuclear thermal power plant. **(10)**
 - b. What is the application of coupling; describe the various types of bearing with the help of suitable diagram. **(5)**
- Q. 4.**
 - a. Explain the various types of manufacturing process with example. **(6)**
 - b. Explain the casting process with suitable diagram. **(5)**
 - c. Explain the any two welding process in detail? **(4)**
- Q. 5.**
 - a. Draw a neat sketch of cross section of timber and explain various part of it **(10)**
 - b. What are the different elements of a building? **(5)**
- Q. 6.**
 - a. Explain the classification of soil in detail. **(7)**
 - b. Explain the physical and chemical classification of rock. **(8)**
- Q. 7.**
 - a. Explain the manufacturing of a brick in detail. **(10)**
 - b. Define foundation, footing, beam, column, Plinth height. **()**

Enrol. No. S R H U

Regn. No. D D

END SEMESTER EXAMINATIONS, JULY-2018
PROGRAM : POLYTECHNIC (ME) THIRD SEMESTER

COURSE CODE : DMET204**COURSE TITLE : THERMAL ENGINEERING - I****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. What do you understand by irreversible process?
- b. Define quasi static process.
- c. What do you mean by isobaric process?
- d. What do you mean by reversibility of process?
- e. Define Joule's coefficient for first law of thermodynamics.
- f. Explain steady flow process.
- g. State zeroth law of thermodynamics.
- h. What do you mean by constant isochoric process?
- i. State ideal gas laws.
- j. Define intensive property with example.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. State the principle and explain PMM 1 and PMM2.
- b. Explain difference between heat engine and heat pump with diagram with statement.
- c. Derive the relation for work done for an isentropic process.
- d. Explain the statement describing second law of thermodynamics.
- e. Explain open, closed and isolated systems and adiabatic process with example.
- f. Derive the equation for specific heat at constant volume and specific heat at constant pressure.
- g. Explain turbine and compressor as an application of S.F.E.E. with diagram.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. Derive the steady flow energy equation with suitable diagram. **(7.5)**
 - b. Explain isothermal and isochoric process in detail and derive the equation for work done by an ideal gas. **(7.5)**
- Q. 4.**
 - a. Explain the T-V diagram for steam formation. **(7.5)**
 - b. State the first law of thermodynamics. What are the limitations of 1st laws of thermodynamics? **(7.5)**
- Q. 5.**
 - a. During a process the temperature of a system rises from 100°C to 200°C. Heat transfer per degree rise in temperature at each temperature reached during process is given by $dQ/dT = 1.005 \text{ kJ/K}$ and the work done for same is given as $dW/dT = (4 - 0.12T) dT$. Calculate change in overall energy during the process. **(7.5)**
 - b. A domestic refrigerator is loaded with food and door is closed. During a certain period the machine consumes 1 kWh of energy and the internal energy of the system drops by 5000 kJ. Find out the net heat transfer. **(7.5)**
- Q. 6.**
 - a. Calculate the final pressure for isothermal process with initial pressure as 9.5 kPa and volume as 12 m³ which reaches finally at 18 m³? **(7.5)**
 - b. What is the final temperature when 10 gm of H₂O at 95°C loses 10 J in atmosphere taking specific heat as 0.9 kJ/kgK? **(7.5)**
- Q. 7.**
 - a. In a thermodynamic process, 5 kJ of energy is added to a system while the system does work equivalent to 10 kJ by expanding against the surroundings. What is the change in internal energy of the system? **(7.5)**
 - b. Four litre of a fluid heated from 30 °C to a final temperature of 90°C. Determine the time required to heat the water if power given by the heater is 1 kW. Take specific heat as 4.18 kJ/kgK. **(7.5)**

Enrol. No. S R H U

Regn. No. D D

END SEMESTER EXAMINATIONS, JULY-2018
PROGRAM : POLYTECHNIC (ME) THIRD SEMESTER

COURSE CODE : DMET203**COURSE TITLE : STRENGTH OF MATERIALS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Define stress and strain.
- b. (i) Maximum bending moment for simply supported beam with point load at centre, $M = \dots\dots\dots$.
(ii) Unit of modulus of rigidity is $\dots\dots\dots$
- c. Write formula for perpendicular axis theorem related to M.I.
- d. What is short and long column?
- e. Give the answers for following in short:
(i) Bending moment is maximum at a point $\dots\dots\dots$
(ii) The point at which BM is zero is called $\dots\dots\dots$
- f. Define polar modulus.
- g. Write the max bending moment for following cases:
(i) Simply supported beam with point load at centre $\dots\dots\dots$
(ii) Cantilever beam with UDL over whole span $\dots\dots\dots$
- h. Torsion equation is given as $\dots\dots\dots$
- i. The value shear stress increases along $\dots\dots\dots$ of the shaft.
- j. Define factor of safety.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. Draw stress strain diagram for mild steel and show various points associated.
- b. Find the Moment of Inertia about centroidal axis I_{xx} of T-section with top flange equal to 150x20 mm and web equal to 100mm x 20mm.
- c. Find slope and deflection for a cantilever beam of 6m span with a point load of 4KN acting at the free end. Take $I = 6.5 \times 10^8$ and $E = 210$ GPa.
- d. Write assumptions taken in pure bending theory.
- e. A hollow shaft has to transmit 53KW at 160 r.p.m. If the maximum shear stress is 50 MPa and internal diameter is half of the external diameter, find the diameters of the shaft.
- f. Explain different type of beams with the help of figures.
- g. What is effective length of column? Write the formula for effective length for all four cases.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
- a. A reinforced concrete column 400mm x 400 mm in section is reinforced with 4 steel bars of 25mm diameter, one in each corner. The column is carrying a load of 500KN. Find the stresses in the concrete and steel bars. Take for steel = 200 GPa and E for concrete = 14 GPa.
 - b. A steel plate is bent into a circular arc of radius 20 meters. If the plate section be 120 mm wide and 20 mm thick, find maximum stress induced and the bending moment which can produce this stress. Take $E = 1.1 \times 10^5$ N/mm².

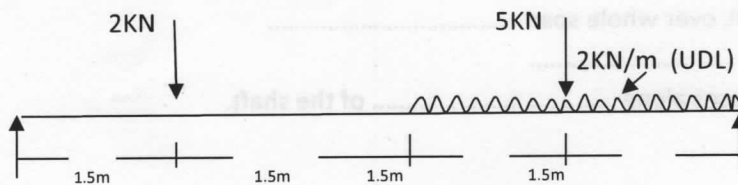
Q. 4. a. Following data refers to a tensile test conducted on a mild steel bar.

- (1) Diameter of the steel bar=30mm; (2) gauge length=220 mm; (3) Extension at load 120KN=0.143mm
(4) Load at yield=235 KN; (5) Maximum load=350 KN; (6) Total extension=53mm

Calculate:

- (i) Young's modulus
 - (ii) yield stress
 - (iii) ultimate strength
 - (iv) percentage elongation
- b. Define following mechanical properties:
- (i) ductility
 - (ii) toughness
 - (iii) malleability
 - (iv) hardness

Q. 5. Draw shear force and bending moment diagram for following beam:



- Q. 6. a. Define polar modulus associated with torsion. Also write the assumptions used in the pure bending theory.
b. A rectangular beam 300 mm deep is simply supported over a span of 4 meters. What UDL load the beam may carry, if the bending stress is not to exceed 120 MPa .Take $I = 225 \times 10^6 \text{ mm}^4$.
- Q. 7. a. The stresses at a point of a machine component are 150MPa and 50 MPa both tensile. Find the intensities of normal, shear and resultant stress on a plane inclined at an angle of 55° with the axis of major tensile stress.
b. A T-section 150mmx20mm top flange and Web 120mm x 20mm is used as a strut of 4m long with hinged at both ends. Calculate the crippling load, if Young's modulus for the material be 200GPa

Enrol. No.

S R H U

Regn. No.

D D

END SEMESTER EXAMINATIONS, JULY-2018

PROGRAM : POLYTECHNIC (ME)

THIRD SEMESTER

COURSE CODE : DMET202

COURSE TITLE : FLUID MECHANICS AND HYDRAULIC MACHINES

[Time allotted: Three hours]

[Max. Marks: 100]

Note: Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.

(2 x 10 = 20)

- Define dynamic viscosity.
- Define specific gravity of a liquid.
- Define Pascal's law.
- Define Bernoulli's principle.
- What do you understand by pressure head?
- What is turbulent flow?
- What is the application of venturimeter?
- Pelton is _____ head and _____ discharge turbine.
- Define specific speed for turbine.
- What is a hydraulic turbine?

SECTION B

Q. 2. Attempt any 5 questions.

(7 x 5 = 35)

- A U-tube containing mercury is used to measure the pressure of an oil of specific gravity 0.88 as shown in Fig 1. Calculate the pressure of the oil, if the difference of mercury level be 0.5m.

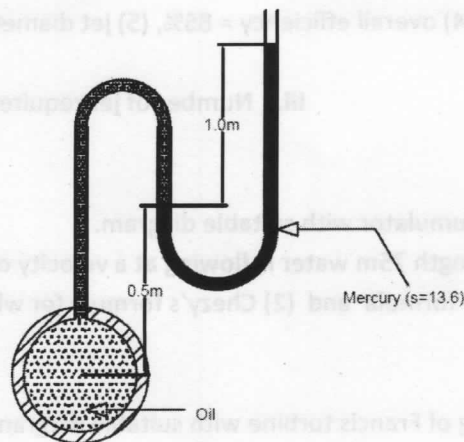


Fig.1

- Calculate the specific weight, density and specific gravity of one liter of a liquid which weight 7N
- A rectangular plate 3m long and 1m wide is immersed vertically in water in such a way that its 3m side is parallel to the water surface and 1m below it. Find:
 - Total pressure on the plate and
 - Position of center of pressure.
- Answer the following:
 - Explain the working of Pitot tube and draw various arrangement of Pitot tube. (4)
 - Explain orifice meter with the help of diagram. (3)
- Explain the following terms with respect to centrifugal pump:

i. manometric efficiency	v. suction head
ii. volumetric efficiency	vi. delivery head
iii. mechanical efficiency	vii. cavitations
iv. overall efficiency	

- f. A horizontal venturimeter with inlet diameter 200mm and throat diameter 100mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180mm of mercury. If the co-efficient of discharge is 0.98 determine the rate of flow.
- g. What is the difference between impulse and reaction turbine?

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.** a. The diameters of a pipe at the inlet and outlet are 300mm and 500mm respectively. If the velocity of water flowing through the pipe at inlet is 3m/s, find: (5)
- i. Discharge through the pipe ii. Velocity of water at outlet.
- b. Explain Venturimeter, draw its diagram and show all parts, also derive the theoretical discharge relation for same. (10)
- Q. 4.** a. Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of specific gravity 0.9, the base of the plate coincides with the free oil surface. (7)
- b. Explain the working of a reciprocating pump with the help of a suitable diagram. (8)
- Q. 5.** a. Explain the following: (8)
- i. total pressure and center of pressure iii. surface tension and capillarity
- ii. compressibility and bulk modulus iv. gauge pressure and absolute pressure
- b. A Pelton wheel is to be designed for the following specifications (1) power (brake /shaft) =9560 KW, (2) head = 300 m, (3) speed =750 rpm, (4) overall efficiency = 85%, (5) jet diameter is 1/6 of wheel diameter. Determine the following: (7)
- i. Wheel diameter iii. Number of jet required
- ii. Jet diameter
- Q. 6.** a. Explain the working of hydraulic accumulator with suitable diagram. (6)
- b. In a pipe of diameter 350mm and length 75m water is flowing at a velocity of 2.8m/s. Find the head lost due to friction using: (1) Darcy-Weisbach formula and (2) Chezy's formula for which C=55. Kinematic viscosity is 0.01 stokes (9)
- Q. 7.** a. Explain the construction and working of Francis turbine with suitable diagram. (7)
- b. Explain the following: (8)
- i. NPSH iv. Coefficient of velocity
- ii. Degree of reaction v. Coefficient of contraction
- iii. Coefficient of discharge

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END SEMESTER EXAMINATIONS, JULY-2018
PROGRAM : POLYTECHNIC (ME) THIRD SEMESTER

COURSE CODE : DMET205**COURSE TITLE : ENGINEERING MATERIALS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. What is thermal insulated material?
- b. What is a polymer?
- c. Name various types of plastics.
- d. Calculate the value of APF for BCC.
- e. What is copper and how is it manufactured?
- f. What is duralumin?
- g. Give any two uses for non-ferrous materials.
- h. Give the composition of grey cast iron.
- i. What is ceramic material?
- j. Name any two protective coating materials.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. What are the objectives of heat treatment?
- b. What is the difference between crystalline and non-crystalline structures?
- c. What are various types of mechanical properties?
- d. Explain thermoplastic and thermo setting plastics and give an example.
- e. Give stress and strain diagram for non-ferrous metals.
- f. Explain the bearing metals.
- g. What is normalizing and nitriding?

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. Explain mechanical behavior of ceramics.
 - b. Give explanation about dopants and uses of ceramics.
- Q. 4.**
 - a. Explain formability and tempering.
 - b. Explain the various types of strengths.
- Q. 5.**
 - a. Explain electrical conductivity and thermal shock.
 - b. Explain fatigue, formability and castability.
- Q. 6.**
 - a. Differentiate between fatigue failure and work hardening.
 - b. Show by diagram how strain hardening takes place in steel.
- Q. 7.**
 - a. Define atomic packing factor. Obtain its expression for SC, FCC and BCC.
 - b. Distinguish between brass and bronze. Discuss various types of bronze stating their compositions and applications.

Enrol. No.

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END SEMESTER EXAMINATIONS, JUNE-2018**PROGRAM : POLYTECHNIC (ME)****FOURTH SEMESTER****COURSE CODE : DMET209****COURSE TITLE : THERMAL ENGINEERING - II****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections and Questions.**SECTION A****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. Define condenser efficiency.
- b. Define equivalent evaporation.
- c. Write the equation for sp. entropy and sp. enthalpy for superheated steam.
- d. What is fusible plug and where is it used?
- e. Define thermal diffusivity.
- f. Define diagram factor.
- g. Define 1 ton of refrigeration.
- h. Define black body and white body.
- i. What is Wien's law of radiation?
- j. Define efficiency of Fins.

SECTION B**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. Derive relation for oxygen required for complete combustion of fuel.
- b. Find out the amount of heat which should be supplied to 1 kg of water at 35 °C temperature to convert it to steam at 5 bar pressure with a dryness fraction of unity.
- c. Explain the working of air-preheater and economizer; also draw the correct sequence of chimney, economizer, air-preheater, and furnace.
- d. What is logarithmic mean temperature difference? List all of its assumptions.
- e. A furnace wall is made up of refractory bricks of 300 mm thick. The inner and outer surface of the wall have temperature of 1000 °C and 150 °C. Find the heat loss per square meter per hour. ($K = 4.5 \text{ W/m}^\circ\text{C}$).
- f. What are the differences between fire tube and water tube boiler?
- g. In a parallel flow of heat exchanger water flow through inner pipe and is heated from 20 °C to 70 °C. Oil flowing through annulus is cooled from 200 °C to 100 °C. It is desired to cool the oil to a lower exit temperature by increasing the length of the heat exchanger. Determine the minimum temperature to which the oil may be cooled.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. What are the differences between forced and free (natural) convection? **(8)**
 - b. Explain and draw a parallel flow heat exchanger also write its LMTD relation with the help of temperature-length graph. **(7)**
- Q. 4.**
 - a. What is the difference between reciprocating and rotary compressor? **(7)**
 - b. Explain the working of locomotive boiler with suitable diagram showing its parts. **(8)**
- Q. 5.**
 - a. Define refrigerant and list out the desired properties of an ideal refrigerant. **(8)**

b. Draw the 4 types of fins, list out the assumption of fins design and also explain cases of fins design. (7)

Q. 6. a. Define boiler efficiency and list the factors on which boiler efficiency depends. (6)

b. A steam power plant works on Rankine cycle between the pressure limits of 70 bar boiler pressure (dry and saturated) and 7 bar condenser pressure. Draw the cycle on T-S Diagram. Determine dryness fraction of steam after expansion and thermal efficiency of the cycle. (9)

Q. 7. a. Explain a reversed Brayton cycle with block, T-S and P-V diagrams. (6)

b. A plane wall is 150 mm thick and its wall area is 4.5 m^2 . If its conductivity is $9.35 \text{ W/m}^\circ\text{C}$ and surface temperature are steady at 150°C and 45°C , determine: (9)

i. heat flow across the plane wall

ii. temperature gradient in the flow direction

SECTION B

(7 x 2 = 14)

- Attempt any 5 questions.
- Derive relation for oxygen required for complete combustion of fuel.
 - Find out the amount of heat which should be supplied to 1 kg of water at 35°C temperature to convert it to steam at 2 bar pressure with a dryness fraction of unity.
 - Explain the working of air-preheater and economizer; also draw the correct sequence of chimney, economizer, air-preheater, and furnace.
 - What is logarithmic mean temperature difference? List all of its assumptions.
 - A furnace wall is made up of refractory brick of 300 mm thick. The inner and outer surface of the wall have temperature of 1000°C and 150°C . Find the heat loss per square meter per hour. ($k = 4.5 \text{ W/m}^\circ\text{C}$).
 - What are the differences between fire tube and water tube boiler?
 - In a parallel flow of heat exchanger water flow through inner pipe and is heated from 20°C to 70°C . Oil flowing through annulus is cooled from 200°C to 100°C . It is desired to cool the oil to a lower exit temperature by increasing the length of the heat exchanger. Determine the minimum temperature to which the oil may be cooled.

SECTION C

(12 x 3 = 36)

- Attempt any 3 questions.
- What are the differences between forced and free (natural) convection?
 - Explain and draw a parallel flow heat exchanger also write its LMTD relation with the help of temperature-length graph.
 - What is the difference between reciprocating and rotary compressor?
 - Explain the working of locomotive boiler with suitable diagram showing its parts.
 - Define refrigerant and list out the desired properties of an ideal refrigerant.

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END SEMESTER EXAMINATIONS, JUNE - 2018
PROGRAM : POLYTECHNIC (ME) FOURTH SEMESTER

COURSE CODE : DMET207**COURSE TITLE : THEORY OF MACHINES****[Time allotted: Three hours]****[Max. Marks : 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt **all** questions.**(2 x 10 = 20)**

- a. Explain the terms: (i) Module, (ii) Pressure angle?
- b. What is the difference between a mechanism and a kinematic chain?
- c. Draw the acceleration diagram for uniform velocity motion of the follower?
- d. Define gear train and give the equations for speed ratio of gear train?
- e. Explain the function of a governor?
- f. What are the different types of cams and followers?
- g. Define couple and give equations for linear motion?
- h. State any two differences between governor and gyroscope?
- i. Give any four types of inversion of four bar mechanism?
- j. Explain the term kinematic link. Give the classification of kinematic link?

SECTION B

Q. 2. Attempt **any 5** questions.**(7 x 5 = 35)**

- a. The mass of flywheel of an engine is 6.5 tonnes and the radius of gyration is 2 metres. It is found from the turning moment diagram that the fluctuation of energy is 60 kN-m. If the mean speed of the engine is 100 r.p.m., find the maximum and minimum speeds.
- b. A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio.
- c. Discuss Gyroscopic couple with diagram. Also mention the governing equation for gyroscopic couple.
- d. Explain the term kinematic chain and all types of inversion of a four bar mechanism in detail.
- e. explain in detail what is flywheel. Derive the equation for the energy stored in a flywheel.
- f. Draw and explain binary, ternary and quaternary links and also give the number of joints for each type of link?
- g. How is a single rotating mass balanced by two masses in the same plane? Explain what are the steps for balancing of several masses rotating in different planes with diagram.

SECTION C

Attempt **any 3** questions.**(15 x 3 = 45)****Q. 3.** What do you understand by gear train? Discuss the various types of gear trains in detail.**(15)**

Q. 4. A cam is to give the following motion to a knife-edged follower .1.Outstroke during 60° of cam rotation; 2. Dwell for the next 30° of cam rotation; 3. Return stroke during next 60° of cam rotation, and 4. Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the displacement, velocity and acceleration diagrams for the follower.

(15)

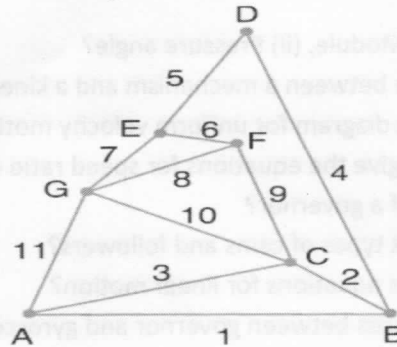
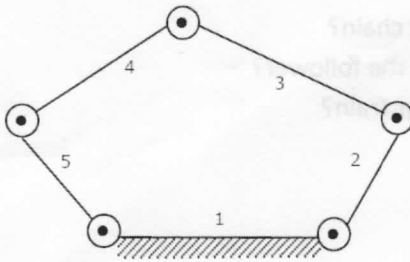
Q. 5. a. The flywheel of a steam engine has a radius of gyration of 1 m and mass 2000 kg. The starting torque of steam engine is 1000N-m and is constant. Determine:

- the angular acceleration of flywheel
- the kinetic energy of flywheel after 5 sec from start time.

(7.5)

b. Calculate the degree of freedom for the following mechanism

(7.5)



Q. 6. Four masses m_1 , m_2 , m_3 and m_4 are 235 kg, 350 kg, 140 kg and 150 kg respectively. The corresponding radii of rotation are 0.25 m, 0.15 m, 0.20 m and 0.4 m respectively and the angles between successive masses are 50° , 80° and 130° . Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2m. (15)

Q. 7. Explain Whiworth quick return motion mechanism and Crank and slotted lever quick return motion mechanism with diagrams. (15)

SECTION C

Enrol. No. S R H U

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END SEMESTER EXAMINATIONS, JUNE-2018
PROGRAM: POLYTECHNIC (ME) FOURTH SEMESTER

COURSE CODE : DMEPT201**COURSE TITLE : PRODUCTION TECHNOLOGY - I****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Write short notes on 3 high rolling mills.
- b. What do you mean by grinding?
- c. Explain the concept of direct and indirect extrusion?
- d. Write a short note on spraying.
- e. Write a short note on gear hobbing.
- f. What is thread grinding?
- g. What is cold rolling?
- h. What do you mean by jobs and station in manufacturing?
- i. What is ring rolling in rolling operation?
- j. What is vapour degreasing in surface treatment?

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. What do you mean by drilling, boring and reaming? Explain drill press with a diagram.
- b. Explain honing process in detail.
- c. Explain the terms wire brushing and belt sanders.
- d. What do you mean by forging operation? Explain open die and closed die forging with a proper sketch.
- e. Explain the difference between impregnation and infiltration.
- f. Explain sintering process used in powder metallurgy.
- g. What is roll bending and how many types of roll mills are there? Explain them.

SECTION C

Attempt any 3 questions.**(15 x 3 = 45)**

- Q. 3.
 - a. What do you mean by hot and cold working? Write its advantages and disadvantages.
 - b. Explain forging operation and its types.
- Q. 4.
 - a. Explain rolling operation and derive its parameters.
 - b. Explain the process of gear hobbing method.
- Q. 5.
 - a. Write a detailed notes on grinding operation. Also define grinding hardness and grit in grinding operation.
 - b. What is super finishing operation? Explain lapping operation with its working principle and application with a diagram.
- Q. 6.
 - a. What is powder metallurgy? Describe all the steps used in powder manufacturing.
 - b. What is vapour degreasing method used for coating?
- Q. 7.
 - a. Explain different costs used in welding.
 - b. Explain the process of welding of grey cast iron.

Enrol. No. S R H U

Regn. No. D D

END SEMESTER EXAMINATIONS, JUNE - 2018
PROGRAM : POLYTECHNIC (ME) FOURTH SEMESTER

COURSE CODE : DMET208**COURSE TITLE : MANUFACTURING TECHNOLOGY - I****[Time allotted: Three hours]****[Max. Marks : 100]****Note:** Attempt all Sections & Questions.**SECTION A****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. What is the importance of manufacturing?
- b. Define extrusion process.
- c. What are the benefits of cold rolling over hot rolling?
- d. Differentiate between coining and embossing.
- e. Write the advantages of arc welding over gas welding.
- f. What are advantages of using a flux in welding?
- g. Differentiate between TIG and MIG.
- h. Define destructive method of testing weld.
- i. Name the shielding gases used in 'Inert gas arc welding'.
- j. What are adhesives?

SECTION B**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. Explain the procedure of tube drawing.
- b. Describe a progressive, combination and a compound die.
- c. Explain the working principle and process of magnetic particle testing method.
- d. With the help of neat sketch explain the spot welding method.
- e. Discuss about the welding electrodes with neat diagram.
- f. With a neat sketch explain the working of electron beam welding.
- g. Discuss the effect of polarity in welding.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. Explain briefly different types of rolling mills used. (7.5)
 - b. Describe the advantages and disadvantages of forging process. (7.5)
- Q. 4.**
 - a. Define any three press work operations. (7.5)
 - b. Describe various bending methods. (7.5)
- Q. 5.**
 - a. Explain the gas metal arc welding process with neat sketch. (7.5)
 - b. Explain Thermit welding process with neat sketch and write its applications. (7.5)
- Q. 6.**
 - a. Briefly explain the testing and inspection of weld. (7.5)
 - b. Describe the dye penetration method of testing weld. (7.5)
- Q. 7.**
 - a. Explain various costs in welding. (7.5)
 - b. Discuss on welding of plastics. (7.5)

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END SEMESTER EXAMINATIONS, JULY-2018
PROGRAM : POLYTECHNIC (ME) FIFTH SEMESTER

COURSE CODE : DMET301**COURSE TITLE : MANUFACTURING TECHNOLOGY - II****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. What is the essential difference between up and down milling?
- b. List any three properties which are desirable for moulding sand from the point of sand casting.
- c. What is draft allowance in a pattern?
- d. What are the functions of cutting fluids?
- e. What are the factors responsible for built-up edge in cutting tools?
- f. What is broaching operation?
- g. What is Centre less grinding?
- h. What is an abrasive? Why the most abrasive now made synthetically?
- i. What are the major functions of cutting fluid used in conventional machining processes?
- j. Give the applications of EDM.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. Explain briefly the following defects in casting:
 - i. Blow holes
 - ii. Misrun
 - iii. Cold shut
- b. What are the desirable characteristics of a cutting tool? Describe them.
- c. Explain the mechanisms by which grinding wheel wear.
- d. Explain the different types of milling operations
- e. Describe the lapping method of finishing operation.
- f. What are the functions of coolants in grinding processes?
- g. Explain the USM process with a neat sketch. Write limitations of the process.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. What are the advantages & limitations of CO₂ moulding & investment casting process? **(7.5)**
 - b. Describe the procedure of making castings by the investment casting process with appropriate sketches. **(7.5)**
- Q. 4.**
 - a. Explain the components of a center lathe. **(7.5)**
 - b. Sketch and describe in brief of a radial drilling machine. **(7.5)**
- Q. 5.**
 - a. Derive an expression for the determination of shear angle in orthogonal metal cutting. **(7.5)**
 - b. Discuss various hole making processes. **(7.5)**
- Q. 6.**
 - a. What is broaching? How broaches are classified? List various broaches. **(7.5)**
 - b. What is super finishing? Explain why finishing is an important manufacturing process. **(7.5)**
- Q. 7.**
 - a. With a neat diagram, explain electric discharge machining. **(7.5)**
 - b. Explain the principle of ECM? What are its advantages and disadvantages? **(7.5)**

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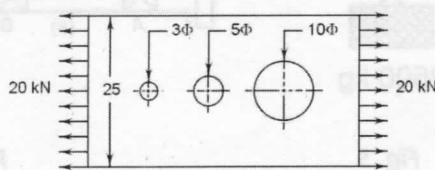
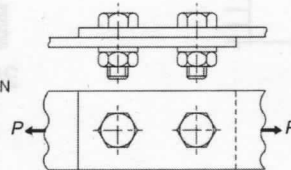
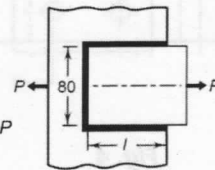
END SEMESTER EXAMINATIONS, JULY-2018
PROGRAM : POLYTECHNIC (ME) FIFTH SEMESTER

COURSE CODE : DMET302**COURSE TITLE : DESIGN OF MACHINE ELEMENTS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.**SECTION A****Q. 1.** Attempt all questions.**(2 x 10 = 20)**

- a. Define Ergonomics.
- b. What is a transition fit? Give examples.
- c. What are the three basic modes of failure of mechanical components?
- d. What is stress concentration factor? What are the causes of stress concentration?
- e. What are the different classifications of welded joint? Explain in detail.
- f. Why is transmission shaft stepped?
- g. What is coupling? Where do you use it?
- h. What are the objectives of parallel and series connections of spring?
- i. What is the difference between coupling & clutch?
- j. What is brake? What are its different classifications?

SECTION B**Q. 2.** Attempt any 5 questions.**(7 x 5 = 35)**

- a. Define preferred numbers. It is required to standardize 11 shafts from 100 to 1000 mm diameter. Specify their diameters.
- b. Find the extreme diameters of shaft and hole for the fit 5H7-d8. What is the type of fit between hole and shaft? Also, calculate the maximum & minimum value on corresponding type of fit.
- c. A rectangular plate, 15 mm thick, made of a brittle material as shown in Fig. 1. Calculate the stresses at each of three holes of 3, 5 & 10 mm diameter.
- d. Two plates are fastened by means of two bolts as shown in Fig. 2. The bolts are made of plain carbon steel 30C8 ($S_{yt} = 400 \text{ N/mm}^2$) and the factor of safety is 5. Determine the size of the bolts, if $P = 5 \text{ kN}$.
- e. 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 welds, as shown in Fig. 3. The strength of the welded joint should be equal to the strength of the plates to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 and 70 N/mm^2 respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds.
- f. A multi-disk clutch consists of two steel disks with one bronze disk. The inner and outer diameters of the contacting surfaces are 200 mm and 250 mm respectively. The coefficient of friction is 0.1 and the maximum pressure between the contacting surfaces is limited to 0.4 N/mm^2 . Assuming uniform wear theory, calculate the required force to engage the clutch and the power transmitting capacity at 720 rpm.
- g. What type of stress is induced in helical compression spring, helical extension spring & helical torsion spring? Distinguish between closely coiled and open coiled helical springs.

**Fig. 1****Fig. 2****Fig. 3**

SECTION C

(15 x 3 = 45)

Attempt **any 3** questions.

Q. 3. What is a cotter joint? Write the design procedure for it.

Q. 4. A brake band attached to the hinge by means of a riveted joint as shown in Fig. 4. Determine the size of the rivets needed for the load of 10 kN. Also, determine the width of the band. The permissible stresses for the band and rivets in tension, shear, and compression are 80, 60 and 120 N/mm² respectively. Assume, margin (m) = 1.5d, $p_t = p$. Find the pitch of the rivets.

Q. 5. A mass of 2500 kg is lowered at a velocity of 1.5 m/s from the drum as shown in Fig. 5. The mass of the drum is 50 kg and its radius of gyration can be taken as 0.7 m. On applying the brake, the mass is brought to rest in a distance of 0.5 m. Calculate:

- i. The energy absorbed by the brake.
- ii. The torque capacity of the brake.

Q. 6. The layout of a shaft carrying two pulleys 1 and 2 supported on two bearings A and B as shown in Fig. 6. The shaft transmits 7.5 kW power at 360 rpm from the pulley 1 to the pulley 2. The diameters of pulleys 1 and 2 are 250 mm and 500 mm respectively. The masses of the pulleys 1 and 2 are 10 and 30 kg respectively. The belt tensions act vertically downward and the ratio of belt tensions on the tight side to the slack side for each pulley is 2.5:1. The shaft is made of plain carbon steel 40C8 ($S_{yt} = 380 \text{ N/mm}^2$) and the factor of safety is 3. Estimate suitable diameter of the shaft.

If the permissible angle of twist is 0.5° per meter length, calculate the shaft diameter on the basis of torsional rigidity. Assume $G = 79300 \text{ N/mm}^2$.

Q. 7. It is required to design a helical compression spring subjected to a force of 1000 N. The deflection of the spring corresponding to this force is approximately 40 mm. The spring index should be 6. The spring is made of cold drawn-steel wire with ultimate tensile strength of 1500 N/mm². The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength ($G = 81370 \text{ N/mm}^2$). Design the spring and calculate:

- i. Wire diameter
- ii. Mean coil diameter
- iii. Number of active coils
- iv. Total number of coils
- v. Free length of the spring
- vi. Pitch of the coils

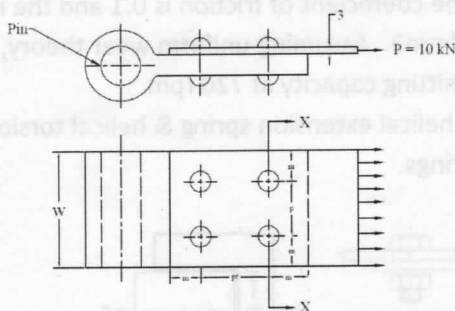


Fig. 4

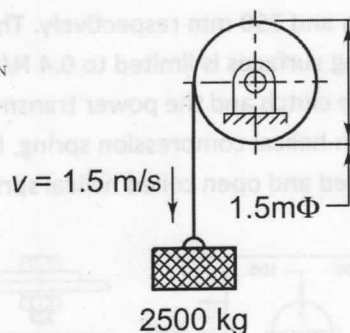


Fig. 5

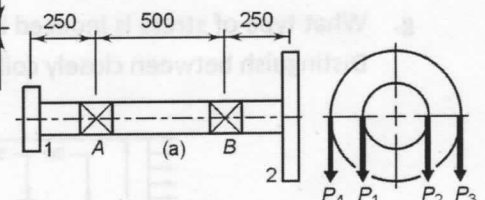


Fig. 6

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END SEMESTER EXAMINATION, JUNE-2018
PROGRAM : POLYTECHNIC (ME) SIXTH SEMESTER

COURSE CODE: DMEAT303**COURSE TITLE : AUTOMOBILE SERVICE, MAINTENANCE & REPAIRS****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Draw viscosity chart for engine oil.
- b. How is specific gravity of battery electrolyte checked?
- c. Name any six workshop tools.
- d. Why is tappet clearance given?
- e. Why shims are used in differential?
- f. Gap kept for CB Point is _____.
- g. What do you understand by preventive maintenance?
- h. Write the firing order for 4 cylinder engine.
- i. Write any four precautions to be taken while working in automobile workshop.
- j. Use of pilot bearing in flywheel is _____.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. Explain lubrication system trouble diagnosis.
- b. What are the various cooling system troubles?
- c. How is the master cylinder repaired?
- d. Explain troubles associated with gear box.
- e. Explain de carbonizing method.
- f. What are various defects associated with main bearings?
- g. Write a short note on ignition system troubles.

SECTION C

Attempt any 3 questions.

(15 x 3 = 45)

- Q. 3.**
 - a. How does a charging system work? Explain with a figure.
 - b. What are various failure associated with clutch?
- Q. 4.**
 - a. Explain opening and fitting of differential.
 - b. What problems are associated with starter motor?
- Q. 5.**
 - a. Explain trouble diagnosis of brake system.
 - b. Explain battery testing method.
- Q. 6.**
 - a. Explain various gear tooth failure.
 - b. Explain properties of lubricating oil.
- Q. 7.**
 - a. Draw trouble diagnosis chart for valves.
 - b. Explain any two special tools related to automobiles.

Enrol. No.

S R H U

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END SEMESTER EXAMINATION, JUNE-2018

PROGRAM : POLYTECHNIC (ME)

SIXTH SEMESTER

COURSE CODE : DMEPT303

COURSE TITLE : PRODUCTION AUTOMATION

[Time allotted: Three hours]

[Max. Marks: 100]

Note: Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.

(2 x 10 = 20)

- Define industrial automation. What are the different elements of automation?
- What do you mean by computer-aided design?
- What do you mean by manufacturing lead-time (MLT)? Explain its importance.
- What is break-even point in manufacturing? Write its formula.
- What do you mean by plant layout? Explain product layout.
- Define material handling system?
- What is flexible manufacturing system?
- What are the different types of dimensioning system? Define them.
- Write the function of M00 & M09.
- Write the function of G20 & G98.

SECTION B

Q. 2. Attempt any 5 questions.

(7 x 5 = 35)

- What are different types of automation systems? Explain all in detail with examples.
- What are the goals of automation? Explain the impact of automation on society.
- A toy manufacturing company has the capacity to produce 12000 toys in a year. Its fixed costs are rupees one Lakh per annum, the variable cost are 20 rupees per unit and the selling price is 40 rupees per unit. Find the Break Even Point (BEP) for quantity and percentage of capacity.
- A production machine is operated 65 hr/week at full capacity. Its production rate is 20 units/hr. During a certain week, the machine produced 1000 good parts and was idle in the remaining time. Determine:
 - The product capacity of the machine.
 - What was the utilization of the machine during the week under consideration?
- Write CNC part program to mill the components as shown in Fig. 1. (Depth of cut = 1 mm)

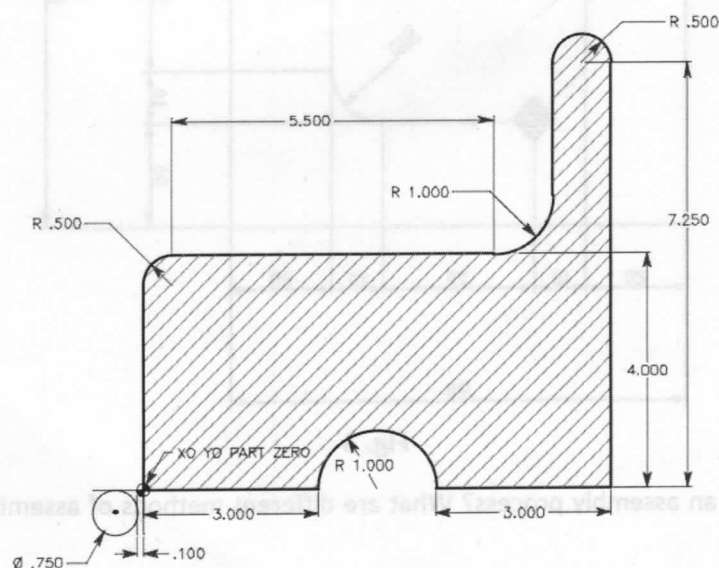


Fig. 1

- f. Write a part program for the Given Dimensions for CNC Lathe Machine for Box Turning Cycle as shown in Fig.2. (Depth of cut = 1 mm)

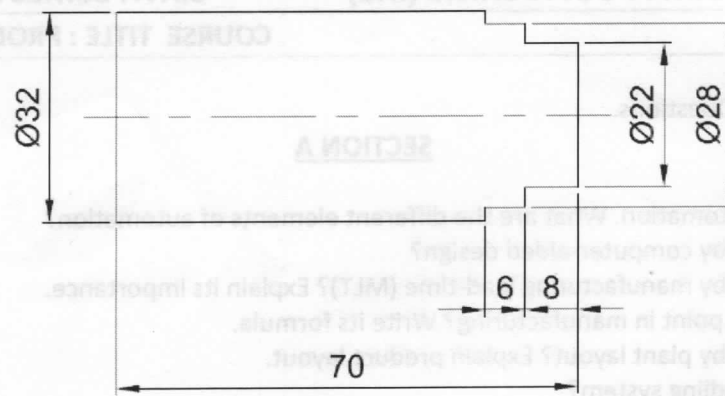


Fig. 2

- g. What do you mean by material handling? What are its objectives? What is the importance of material handling system in industry?

SECTION C

Attempt **any 3** questions.

(15 x 3 = 45)

- Q. 3. What are different applications of automation? Explain any three in detail with suitable examples.
- Q. 4. What do you mean by Numerical Control? What is the difference between NC & CNC machines, with at least seven differences between them? Draw a block diagram for NC and CNC system also.
- Q. 5. Write a program for the given drawing as shown below in Fig. 3.

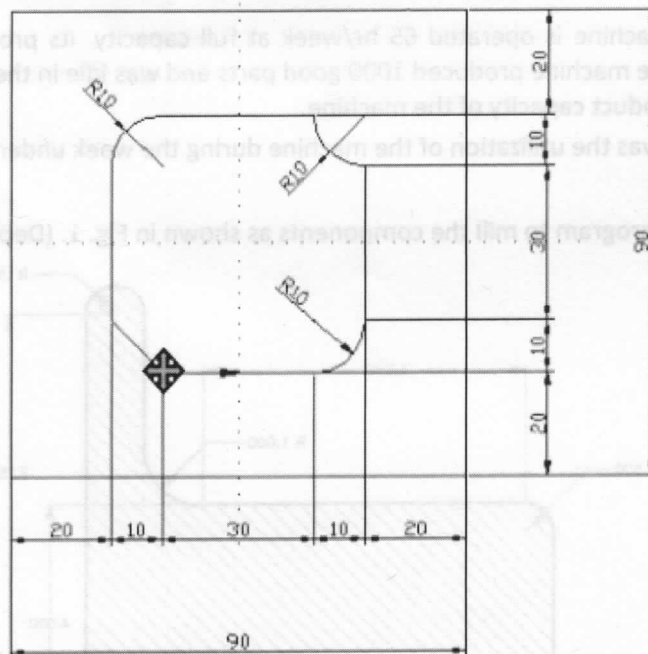


Fig. 3

- Q. 6. What do you mean by an assembly process? What are different methods of assembly? Explain all in detail with examples.
- Q. 7. What are the various types of material handling system? Explain all in detail with examples.

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END SEMESTER EXAMINATIONS, JUNE - 2018
PROGRAM: POLYTECHNIC (ME) SIXTH SEMESTER

COURSE CODE : DMET303**COURSE TITLE : RENEWABLE ENERGY****[Time allotted: Three hours]****[Max. Marks: 100]****Note:** Attempt all Sections & Questions.

SECTION A

Q. 1. Attempt all questions.**(2 x 10 = 20)**

- a. Write the various types of renewable energy used and their sources.
- b. Define Zenith angle, solar altitude and Azimuth angle.
- c. What is the purpose of wind vane in HAWT?
- d. What are the various environmental effects of using Wind Turbine?
- e. Define the term solar constant.
- f. Name the various geothermal sources.
- g. Write a short note on Pyrolysis.
- h. Explain the use of Deaerator in open cycle OTEC plant.
- i. What is the purpose of Digester in Biogas plant?
- j. Write a short notes on Magma resources in Geothermal plant.

SECTION B

Q. 2. Attempt any 5 questions.**(7 x 5 = 35)**

- a. What are primary and secondary energy sources? Explain the conventional and non-conventional energy sources.
- b. Define geothermal energy? Explain Hot Dry rocks system in geothermal energy.
- c. Define the term solar collector and explain the Line focus collector.
- d. Explain the term pyrheliometer and define Angstrom pyrheliometer with a neat sketch.
- e. Define pyranometer and explain Eppley pyranometer.
- f. What is the difference between biogas and biomass? How the electricity is generated from Biogas plant?
- g. How is electricity generated from the ocean? How does the closed cycle help in generating electricity as compared to open cycle OTEC plant.

SECTION C

Attempt any 3 questions.**(15 x 3 = 45)**

- Q. 3.**
 - a. Describe the construction & working of solar water heater.
 - b. Define how energy is generated from solar PV plant. Describe the types of solar cell used now-a-days.
- Q. 4.**
 - a. Explain the basic principle in term solar thermal electric conversion plant. Explain parabolic trough power plant.
 - b. Explain the term vertical axis wind turbine with its working. Explain Darrieus VAWT with diagram.
- Q. 5.**
 - a. Define the term biogas. Explain briefly the Fixed Dome Biogas plant with a neat sketch.
 - b. Define the term Biomass and explain gasification process.
- Q. 6.**
 - a. Define a Geothermal source. Describe a liquid dominated system with a neat sketch.
 - b. What are various advantages and disadvantages of geothermal energy forms? Define vapour Dominated system with its working.
- Q. 7.**
 - a. How energy from tides is generated? Explain the working of a tidal Barrage Plant with a neat sketch.
 - b. How energy is generated from winds? Explain HAWT with a neat sketch.
