Model Question Paper (CBCS) with effect from 2015-16

USN | | | | | | | | | | | 15ME32

Third Semester B.E. Degree (CBCS) Examination, Dec.2016/Jan.2017

Material Science & Metallurgy

Time: 3 hrs. Max. Marks: 80

Answer any FIVE full questions, choosing one full question from each module.

Module 1

1) A) Define atomic packing factor. Sketch the unit cell of a FCC & HCP crystal structure. Derive an expression for the density of atomic packing to FCC & HCP structure. (12 Marks)

B) The unit cell of chromium is cubic and contains 2 atoms. Determine the dimension of the chromium unit cell when atomic weight (C_v) = 52 and density of chromium (ρ) =7.19mgm^{-3}. (4 Marks)

OR

2) A) Sketch & explain different stages of creep. Which stage of creep is considered during designing a product? (8 Marks)

B) What do you mean by imperfection in crystals? Explain briefly the different types of crystal imperfections. (8 Marks)

Module 2

3) A) Mention the types of solid solutions. Enumerate Hume-Rothary rules governing the formation of solid solution. (8 Marks)

B) State & explain Gibbs phase rule. (4 Marks)

C) Explain the factors governing the formation of substitutional solid solutions. (4 Marks)

OR

4) A) Draw the Iron-carbon equilibrium diagram and label it. Show the invariant reactions. (8 Marks)

B) List & Discuss different types of stainless steels. (4 Marks)

C) Explain the effect of common alloying elements on steel. (4 Marks)

Module 3

5) A) What is Hardenability? Explain with neat sketch jominy-end quench test. (8 Marks)

B) Explain the steps to construct TTT diagram. Draw a labeled sketch of TTT diagram for an eutectoid steel. (8 Marks)

OR

6) A) Define surface hardening process. With the help of neat sketch explain different types of carburizing process. (8 Marks)

B) Sketch and explain any two types of cast iron, with microstructure, composition and properties. (8 Marks)

Module 4

7) A) Sketch & explain different methods of processing ceramics. (8 Marks)

B) Distinguish between the properties of ceramics, metals and plastics. (8 Marks)

OR

8) A) With a neat sketch explain any two methods of processing plastics. (8 Marks)

B) What are shape memory alloys? List the applications of shape memory alloys. Discuss the term "shape memory effect". (8 Marks)

Module 5

9) A) Define composite material. Give the classification based on matrix and reinforcement. (8 Marks)

B) Sketch and explain Pultrusion process and filament winding process and mention the applications. (8 Marks)

OR

10) A) Sketch and explain Hand layup and spray layup process. Discuss their advantages and limitations. (8 Marks)

B) Derive the rule of mixtures for the modulus of elasticity of a fiber reinforced composite, when a stress is applied along the axis of the fiber. (8 Marks)

Model Question Paper – I (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15ME32

Third Semester B.E. Degree (CBCS) Examination, Dec.2016/Jan.2017

Material Science & Metallurgy

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module I

1 a. What are Imperfections? Explain how imperfections are helpful in engineering materials? (6 Marks)

b. Discuss the different types of stress cycles which can cause fatigue failure with the help of neat sketch. (4 Marks)

C Illustrate the phenomenon and mechanisms of Diffusion. (6 Marks)

OR

2 a. Compare the engineering stress and strain with the true stress and strain for the tensile test of a low carbon steel that has the following test values:
Load applied to specimen: 75kN
Initial diameter of specimen: 12.5mm
Diameter of specimen under 75kN load: l2mm. Assume no change in volume. (6 Marks)

b. List the various types of fractures in materials. (4 Marks)

c. Define creep. Explain the differences in various stages of creep with a neat figure. (6 Marks)

Module II

3 a. Two metals 'A' & 'B' are used to form an alloy containing 70%A & 30%B. 'A' melts at 610^{o}c and 'B' at 410^{o}c.When alloyed together, these metals form no compound or solid solution but forms eutectic at 40%A & 60%B. The eutectic solidifies at 260^{o}c. Find (10 Marks)

i. The temperature at which the alloy will begin to crystallize from the melt and at which the melt will be completely solid.

ii. The percentage of eutectic in the alloy at room temperature and 300^{o}c.

b. Define Nucleation. Explain heterogeneous nucleation with neat sketch. (6 Marks)

OR

4 a. Draw the Iron -carbon equilibrium diagram and label various phases present. Write the invariant reactions occurring in the diagram, indicating the temperature and compositions. (10 Marks)

b. Discuss the effect of alloying elements in steel. (6 Marks)

Module III

5 a. Describe the methods of Hardening & Tempering heat-treatments with a neat sketch? Infer why hardening should be always followed by tempering process. (8 Marks)

b. Differentiate between Annealing & Normalizing. (4 Marks)

c. Discuss the properties, microstructure and composition of grey cast-iron. (4 Marks)

6 a. Explain various phases of T-T-T diagram for 0.8%c steel superimposing at least one cooling curve on it. (8 Marks)

b. Discuss any two surface hardening methods with suitable applications. (8 Marks)

Module IV

7	a.	List the properties of Ceramics.	(4 Marks)
	b.	Explain the slip casting method of processing Ceramics.	(6 Marks)
	c.	Differentiate between thermoplastic plastics & thermosetting plastics.	(6 Marks)

OR

8	a.	List the applications of Shape Memory Alloys.	(5 Marks)
	b.	Explain the working of a Optical fiber.	(5 Marks)
	c.	Write short notes on smart materials used as implants in human body.	(6 Marks)

Module V

9	a.	Classify composites based on the matrix and fiber reinforcement with specific applications of each.	(10 Marks)
	b.	Explain the Sheet-Moulding Compound (SMC) process of producing composites.	(6 Marks)

OR

10	a.	Determine the young's modulus of a fiber-reinforced composite in i. Iso-stress ii. Iso-strain conditions	(10 Marks)
	b.	What are hybrid composites? List their applications.	(6 Marks)

Model Question Paper – 1 (CBCS) with effect from 2015-16

USN | | | | | | | | | | | 15ME33

Third Semester B.E. Degree (CBCS) Examination, Dec.2016/Jan.2017

Basic Thermodynamics

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of Thermodynamic data handbook and steam table is permitted.

MODULE- 1

1 a. Define the following with examples.
i) Open system ii) Closed system iii) Isolated system **(08Marks)**

b. State Zeroth law of thermodynamics. The readings t_A and t_B of two Celsius thermometers A and B agree at ice & steam point, but elsewhere are related by the equation $t_A=L+Mt_B+Nt_B^2$ where L,M,N are constants, when both thermometers are immersed in a system of fluid , A registers 11°C while B registers10°C.Determine the reading on A when B registers 37.4°C **(08 Marks)**

OR

2. a. Define thermodynamic work. Write similarities & dissimilarities between Heat and Work. **(08Marks)**

b. A gas initially at 100KPa and 6000cm^3. The final volume is 2000cm^3. Determine the moving boundary work for each of the following processes.
(i) P is inversely proportional to V (ii) PV^2= constant iii) P is inversely proportional to V **(08Marks)**

MODULE- 2

3. a. Describe the classic paddle wheel experiment performed by Joule. What conclusion was drawn based on the experimental observations (Joule experiment). **(08Marks)**

b. A turbine operates under steady flow conditions, receives steam at the following state: Pressure 1.2MPa, temperature 188oC, enthalpy 2785KJ/Kg, velocity 34 m/s & elevation 3m. The steam leaves the turbine at the following state: pressure 20Mpa, enthalpy 2512KJ/kg, velocity 100m/s and elevation 0 m. Heat loss to the surrounding at a rate of 0.29KJ/s. If the steam rate is0.42kg/s.Determine power output from the turbine. **(08Marks)**

OR

4. a. State and Prove that Kelvin- Planck and Clausis statements of second law of thermodynamics (**08Marks)**

b. Using a heat engine of thermal efficiency of 30% to drive a refrigerator having a COP of 5, what is the heat received by the heat engine for each MJ of heat removed from the cold body of the refrigerator? **(08Marks)**

MODULE- 3

5. a. Define reversible heat engine with temperature reservoirs diagrams. **(02Marks)**

   b. Explain the factors such as friction, heat transfer through a finite temperature difference, unresisted expansion that renders the process irreversible. **(06Marks)**

OR

6. a. Define Entropy and explain Principle of increase of entropy. **(02Marks)**

   b. Two copper blocks weighing 10kg each are initially at temperatures of 227^{o}C and 27^{o}C respectively. What is the change in entropy when these two blocks are brought in contact with each other? Assume specific heat of copper as 0.4KJ/kg k **(06Marks)**

MODULE -4

7. a. Define availability and irreversibility **(02Marks)**

   b. Explain availability function for closed system (Non flow Process) and open system (Steady Flow process). **(06Marks)**

OR

8. a. Define dryness fraction of the steam? What are methods used to measure dryness fraction? with neat sketch explain any one method. **(08Marks)**

   b. Calculate the internal energy per kg of superheated steam at pressure of 10 bar and a temperature of 3000 C. Also find the change in internal energy if this steam is expanded to 1.4 bar and dryness fraction 0.8. **(08Marks)**

MODULE -5

9. a. Distinguish between Ideal and Real gas. Starting from the relation Tds = du + Pdv show that for an ideal gas undergoing a reversible adiabatic process, the law for the process is given by TV^{n-1}= constant. **(08Marks)**

10. a. A balloon of sphere shape 6m in diameter is filled with hydrogen gas at a pressure of 1 bar abs and 20^{0}C. At a later time, the pressure of the gas is 94% of its original pressure at the same temperature. i) What mass of the original gas must have escaped If the dimensions of the balloon is not changed.

   ii) Find the amount of heat removed to cause the dame drop in pressure at constant volume. Take Cv for hydrogen as 10400J/kg K

Model Question Paper (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15ME34

Third Semester B.E. Degree (CBCS) Examination

Mechanics of Materials

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

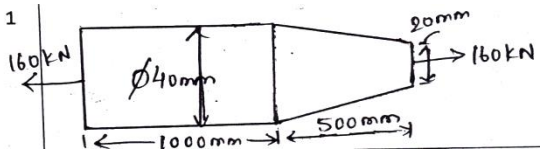
MODULE – I

1 **a** Define the following. (i) Stress (ii) Strain (iii) Poisson's ratio (iv) Elasticity (08 Marks)

b The following data refers to mild steel specimen tested in a laboratory. (08 Marks)
Diameter of specimen = 24mm; Gauge length = 200mm; Extension under load = 0.04mm; Yield point load = 150kN; Maximum load = 225kN; Neck diameter = 18.2mm; Load at failure = 275mm. Determine (i) Young's modulus; (ii) Yield stress (iii) Ultimate stress (iv) percentage elongation.

OR

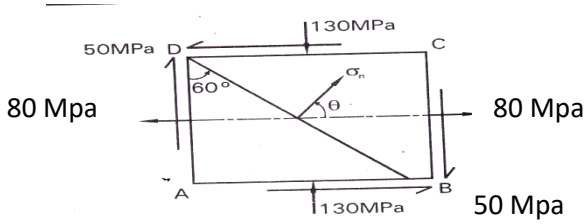
2 **a** Determine the elongation of bar shown in fig when subjected to a tensile load of 150kN. Take E = 200Gpa (08 Marks)



b Derive relation between Young's modulus(E), Modulus of rigidity(G) & Bulk modulus(K) (08 Marks)

MODULE – II

3 **a** A point in a machine member is subjected to stresses as shown in fig. Determine (i) Stresses on a plane which is at an angle of 60^0 w.r.t 80MPa stress. (ii) Magnitude of principal stresses and their locations. (iii) Maximum shear stresses and their locations, by Mohr's circle method (08 Marks)

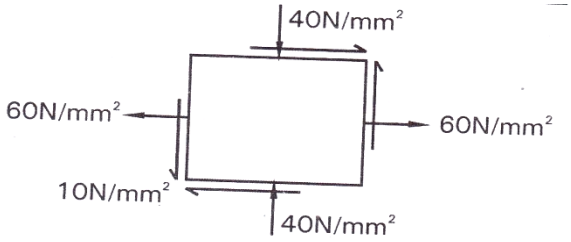


b Define thick & thin cylinder. Also derive an expression for circumferential stress in a thin cylinder (08 Marks)

OR

4 **a** Derive an expression for normal and shear stress on an inclined plane of a member subjected to uni-axial stress (08 Marks)

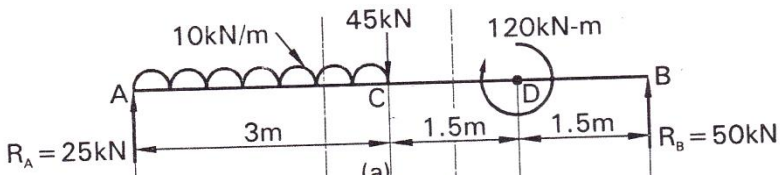
b The state of stress at a point is as shown in fig. Determine (i) Direction of principal planes; (ii) Magnitude of principal stresses (iii) Magnitude of maximum shear stress and its directions. (08 Marks)



MODULE – III

5 **a** Differentiate statically determinate and statically indeterminate beams (08 Marks)

b Draw the SFD and BMD for the structure shown in fig. and find Point of contraflexure. (08 Marks)



OR

6 **a** Derive an expression for Governing differential equation for a beam (08 Marks)

b A cantilever has length of 3m. Its cross-section is of T type with flange 100mmx20mm and web 200mmx12mm, the flange in tension. What is the intensity of UDL that can be applied if the maximum tensile stress is limited to 30N/mm^2. Also compute the maximum compressive stress (08 Marks)

MODULE – IV

7 **a** State the assumptions and Derive General torsional equation (08 Marks)

b A solid shaft has to transmit a power of 1000KW@ 120rpm. Find the diameter of the shaft if shear stress is not to exceed 80N/mm^2. The maximum torque is 1.25times of its mean. What percentage of saving in material would be obtained if the shaft is replaced by hollow shaft whose internal diameter is 0.6times its external diameter. The length, speed, material and maximum shear stress being same (08 Marks)

OR

8 **a** Derive an expression for Euler's crippling load for a column when both of its ends are hinged or pinned (08 Marks)

b A hollow C.I circular section column is 7.5mm long and is pinned at its both ends. The inner diameter of the column is 160mm and the thickness of the wall is 20mm. find the safe load by Rankine's formula, using factor of safety of 5. Also find the slenderness ratio and ratio of Euler's and Rankine's critical loads. Take $\sigma_c = 550N/mm^2$, $\alpha = 1/1600$ & $E = 8x10^4$ (08 Marks)

MODULE – V

9 **a** Define Theories of failures and explain Maximum principal stress theory (08 Marks)

b A rod of circular section is to sustain torsion of 300kN-m & bending moment of 200kN-m. Selecting C40 steel (σ_y= 353Mpa) & assuming FOS=3. Determine the diameter of rod as per (i) Maximum normal stress theory. (ii) Maximum shear stress theory (08 Marks)

OR

10 **a** Derive one expression for strain energy stored in an elastic bar when subjected to axial load, torque and bending moment (08 Marks)

b The maximum stress produced by a pull in a bar of length 1100mm is 100N/mm^2. The area of c/s and length are shown in fig. Calculate the total strain energy stored in bar if E= 200Gpa (08 Marks)

Model Question Paper - (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15ME34

Third Semester B.E. Degree (CBCS) Examination

Mechanics of Materials

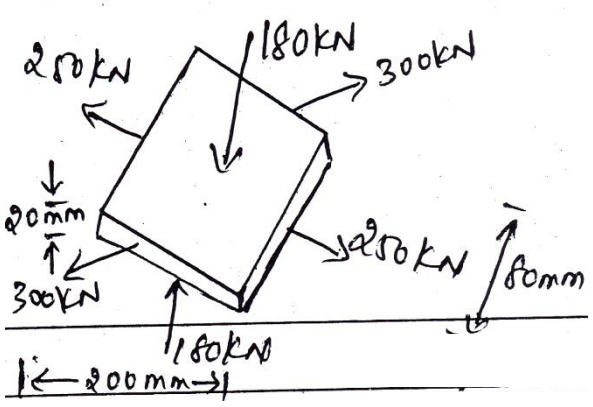
Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** State Hooke's law. (02 Marks)

b A block size of 200mmx80mmx20mm is subjected to forces as shown in fig. determine (i) Change in dimensions (ii) Change in volume. (10 Marks)



c Determine an expression for shortening /extension of bar (04 Marks)

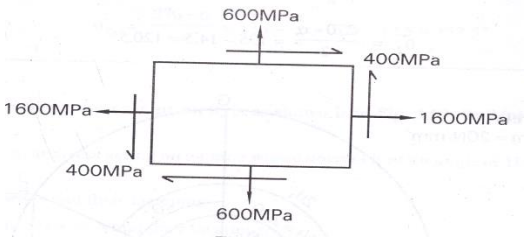
OR

2 **a** Derive an expression for deformation of tapering bar (circular c/s) (08 Marks)

b When the temperature of the compound bar is increased by 50^0c. determine the stresses induced in each bar considering the following cases (i) Rigid supports (ii) Supports yield by 0.5mm. Take $\alpha_s = 12x10^{-6}/^0c$; $\alpha_c = 19x10^{-6}/^0c$; $\alpha_{Al} = 22x10^{-6}/^0c$, $E_s = 200GPa$; $E_c = 83GPa$; $E_{Al} = 70GPa$. (08 Marks)

MODULE – II

3 **a** Using Mohr's circle determine the principal stress and the planes. Show the same on element separately. (12 Marks)



b Define Principal stresses and planes. (04 Marks)

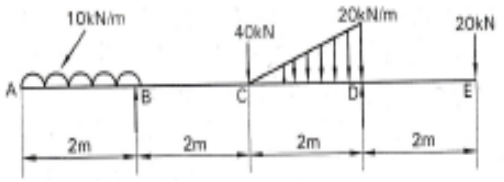
OR

4 **a** An element is subjected to principal tensile stresses across 2 perpendicular planes as shown in fig. Determine normal stress, shear stress and resultant stress on the plane EC. Determine the obliquity. What will be the intensity of stress which is acting alone will produce the same maximum strain if poisson's ratio is0.33. (08 Marks)

b Prove that half the difference between principal stresses is equal to maximum shear stress (10 Marks)

MODULE – III

5 **a** Draw the SFD and BMD for the structure shown in fig. and find Point of contra flexure and find maximum bending moment (16 Marks)



OR

6 **a** Derive an expression for maximum slope and deflection for a cantilever beam subjected to UDL (08 Marks)

b Derive Bernoulli- Euler Bending equation or General Bending equation and state assumptions (08 Marks)

MODULE – IV

7 **a** State Determine the diameter of the solid shaft which will transmit 440KW at 280 rpm. The angle of twist is 1^0/metre length and shear stress should not exceed 40Mpa.Assume G=80GPa (08 Marks)

b Prove that Torsional strength of hollow shaft is greater than that of solid shaft (08 Marks)

OR

8 **a** Derive an expression for Euler's crippling load for a column when one of its ends are hinged or pinned (08 Marks)

b A hollow C.I circular section column is 2.8m long is fixed at one end and hinged at the other end. External diameter is 150mm and thickness of wall is 15mm. Take σ_c = 550N/mm^2, α= 1/1600 & E = 8x10^4. Compare bucling load using Euler's and Rankine's formula (08 Marks)

MODULE - V

9 **a** Explain Maximum Shear stress theory and state the need of theories of failure. (08 Marks)

b A plate of C45 steel (σ_y = 353Mpa) is subjected to the following stresses. (08 Marks)
σ_x= 150N/mm^2; τ_{xy} = 50N/mm^2. Find FOS by
(i) Maximum Principal stress theory.
(ii) Maximum shear stress theory

OR

10 **a** Define strain energy, Resilience, Proof resilience and Modulus of resilience (08 Marks)

b A cantilever beam of length 'L' carries UDL 'W' per unit length over its entire length. Determine (i) strain energy stored in beam (ii) If W=10kN/m; L=2m & EI=2x10^{5}kN-m^2 determine strain energy (08 Marks)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written e.g, 38+2 = 40, will be treated as malpractice.

Model Question Paper -1 (CBCS) with effect from 2015-16

USN | | | | | | | | | | | **15ME35A**

Third / Fourth Semester B.E. Degree (CBCS) Examination

Metal Casting and Welding

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1. a. List and briefly explain the steps involved in making a sand casting. **(08 Marks)**
   b. List different types of pattern. Explain match plate pattern with a neat sketch **(04 Marks)**
   c. Briefly discuss the importance of binders and additives in Sand Moulding **(04 Marks)**

OR

2. a. Discuss the desirable properties of moulding sand. **(04 Marks)**
   b. Draw a neat sketch of gating system showing all the elements. **(04 Marks)**
   c. With a neat sketch explain the working principle of jolt and squeeze machine **(08 Marks)**

MODULE – II

3. a. With a neat sketch explain the different zones present in CUPOLA furnace **(08 Marks)**
   b. With a neat sketch explain the constructional features and working of electrical resistance furnace. List its advantages and disadvantages. **(08 Marks)**

OR

4. a. With a neat sketch explain continuous casting process and mention its merits and demerits. **(08 Marks)**
   b. What is die casting? With a neat and labeled sketch, explain cold chamber die casting process? (**08 Marks)**

MODULE - III

5. a. What is degassing? Explain two types of vacuum degasification methods with neat sketches. **(08 Marks)**
   b. Briefly explain the practical measures that can be used to control directional solidification in order to obtain sound casting **(08 Marks)**

OR

6. a. Explain with neat sketches different casting defects during casting process. **(08 Marks)**
   b. With a neat sketch, explain the principle of stir casting process. **(08 Marks)**

MODULE - IV

7. a. Sketch and explain TIG welding process. Mention its advantages, disadvantages and limitations **(08 Marks)**
   b. Explain with a neat sketch Submerged Arc Welding (SAW) process. **(08 Marks)**

OR

8. a. With a neat sketch explain LASER beam welding and mention its advantages, disadvantages and limitations. **(08 Marks)**
   b. Sketch and explain Thermit welding process and mention its advantages, disadvantages and limitations. **(08 Marks)**

MODULE - V

9. a. What is Heat Affected Zone (HAZ)? Explain the parameters affecting HAZ. **(08 Marks)**
   b. Write short notes on: a) Residual stresses in welding b) Electrodes used in welding c) Welding defects **(08 Marks)**

OR

10. a. Compare soldering and brazing process. Mention their advantages, limitations and applications? **(08 Marks)**
    b. What are different non destructive testing (NDT) methods and explain with a neat sketch Radiographic Inspection Method **(08 Marks)**

Model Question Paper - II (CBCS) with effect from 2015-16

USN | | | | | | | | | | | **15ME35A**

Third / Fourth Semester B.E. Degree (CBCS) Examination

Metal Casting and Welding

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE –1

1. a. Define Casting? Briefly explain the steps involved in making a sand casting. **(08 Marks)**
   b. Explain in detail various allowances given to pattern and reasons to provide the allowances **(08 Marks)**

OR

2. a. List the types of moulding sand. Discuss the desirable properties of moulding sand. **(08 Marks)**
   b. With a neat sketch, describe the shell moulding process. List advantages of the process **(08 Marks)**

MODULE – II

3. a. With a neat sketch explain the different zones present in CUPOLA furnace **(08 Marks)**
   b. With a neat sketch explain the constructional features and working of direct arc electrical furnace. **(08 Marks)**

OR

4. a. What is die casting? With a neat and labeled sketch, explain hot chamber die casting process? (**08 Marks)**
   b. With a neat sketch explain continuous casting process and mention its merits and demerits. **(08 Marks)**

MODULE - III

5. a. What is nucleation? Explain types of Nucleation with neat sketches **(08 Marks)**
   b. Explain the factors to control directional solidification **(08 Marks)**

OR

6. a. Explain fettling and various casting defects during casting process. **(08 Marks)**
   b. With a neat sketch, explain the principle of stir casting process. **(08 Marks)**

MODULE - IV

7. a. Sketch and explain MIG welding process. Mention its advantages, disadvantages and limitations **(08 Marks)**
   b. Explain with a neat sketch Submerged Arc Welding (SAW) process. **(08 Marks)**

OR

8. a. With a neat sketch explain Electron beam welding and mention its advantages, disadvantages and limitations. **(08 Marks)**
   b. Sketch and explain Thermit welding process and mention its advantages, disadvantages and limitations. **(08 Marks)**

MODULE - V

9. a. What is Heat Affected Zone (HAZ)? Explain the parameters affecting HAZ. **(08 Marks)**
   b. Write short notes on: a) Electrodes used in welding b) Welding defects **(08 Marks)**

OR

10. a. With a neat sketch, explain the Oxy – acetylene gas welding process **(08 Marks)**
    b. What are different non destructive testing (NDT) methods and explain with a neat sketch Magnetic particle inspection Method **(08 Marks)**

CBCS

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15ME36A/46A

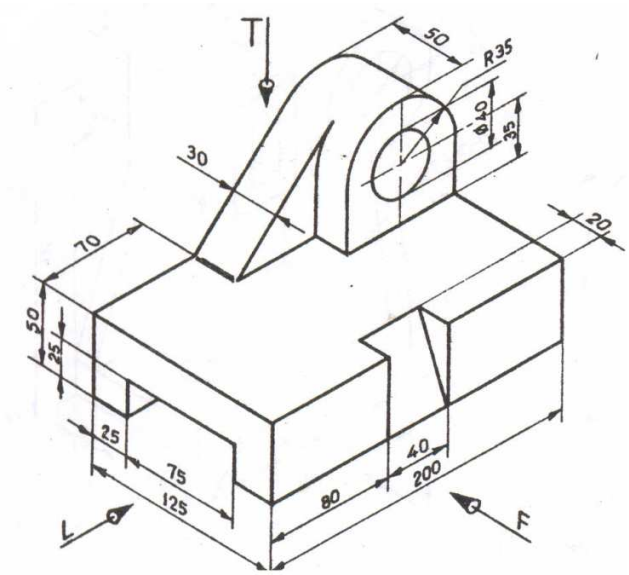
Third Semester B.E. Degree Examination
(MECHANICAL)
COMPUTER AIDED MACHINE DRAWING

Time: 3 Hours **Max. Marks: 80**

Note: 1. Answer any ONE question from each of the parts A, B and C.
2. Use **FIRST ANGLE** projection only.
3. Missing data if any may suitably be assumed.
4. All the calculations should be on answer sheet supplied.
5. All the dimensions are in mm.
6. **Part C Assembled View should be in 3D and other 2 views in 2D.**

PART A

1. Using First Angle Projection, Draw the Orthographic Views of the object shown in fig below.



15Marks

2. Draw the following profiles of pitch 50mm.

i. Square thread
ii. ISO thread **15Marks**

PART B

3. Draw the following views an assembled Knuckle Joint to 1:1 scale assuming the diameter of the shaft d = 20mm.

i. Front view with top half in section
ii. Top view **15 Marks**

4. Draw sectional Front View & Side View of a Protected Type Flange Coupling to connect two shafts of diameter 30mm. Indicate the dimensions. **15 Marks**

PART C

5. Figure 1 shows the details of 'TAIL STOCK'. Assemble the parts and draw the following views of the assembly.

i. Sectional Front View
ii. Top View **50 Marks**

6. Details of 'MACHINE VICE' are shown in following Figure 2. Assemble the parts and draw the following views of the assembly.

i. Sectional Front view
ii. Top view **50 Marks**

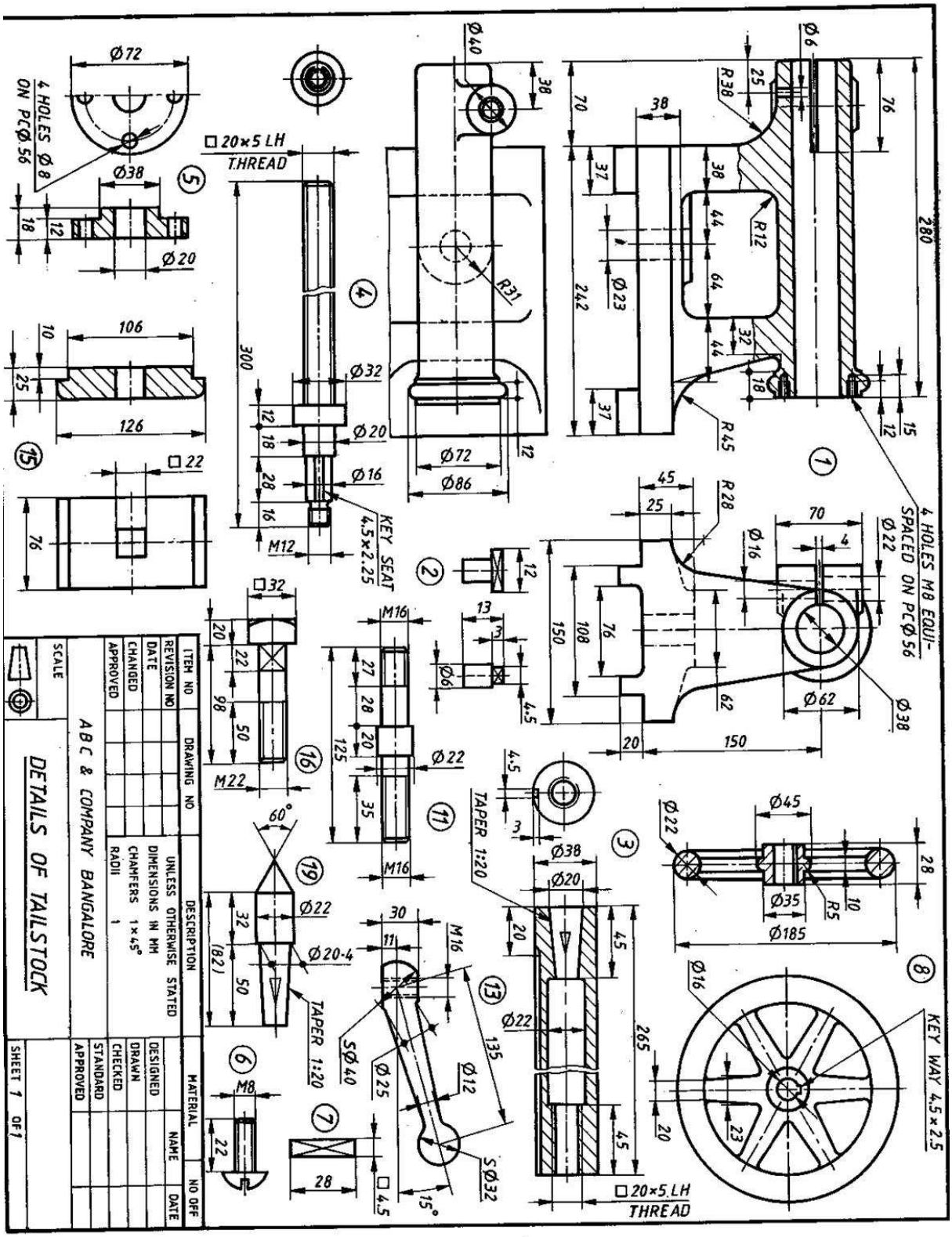


Figure 1 ‘TAIL STOCK'

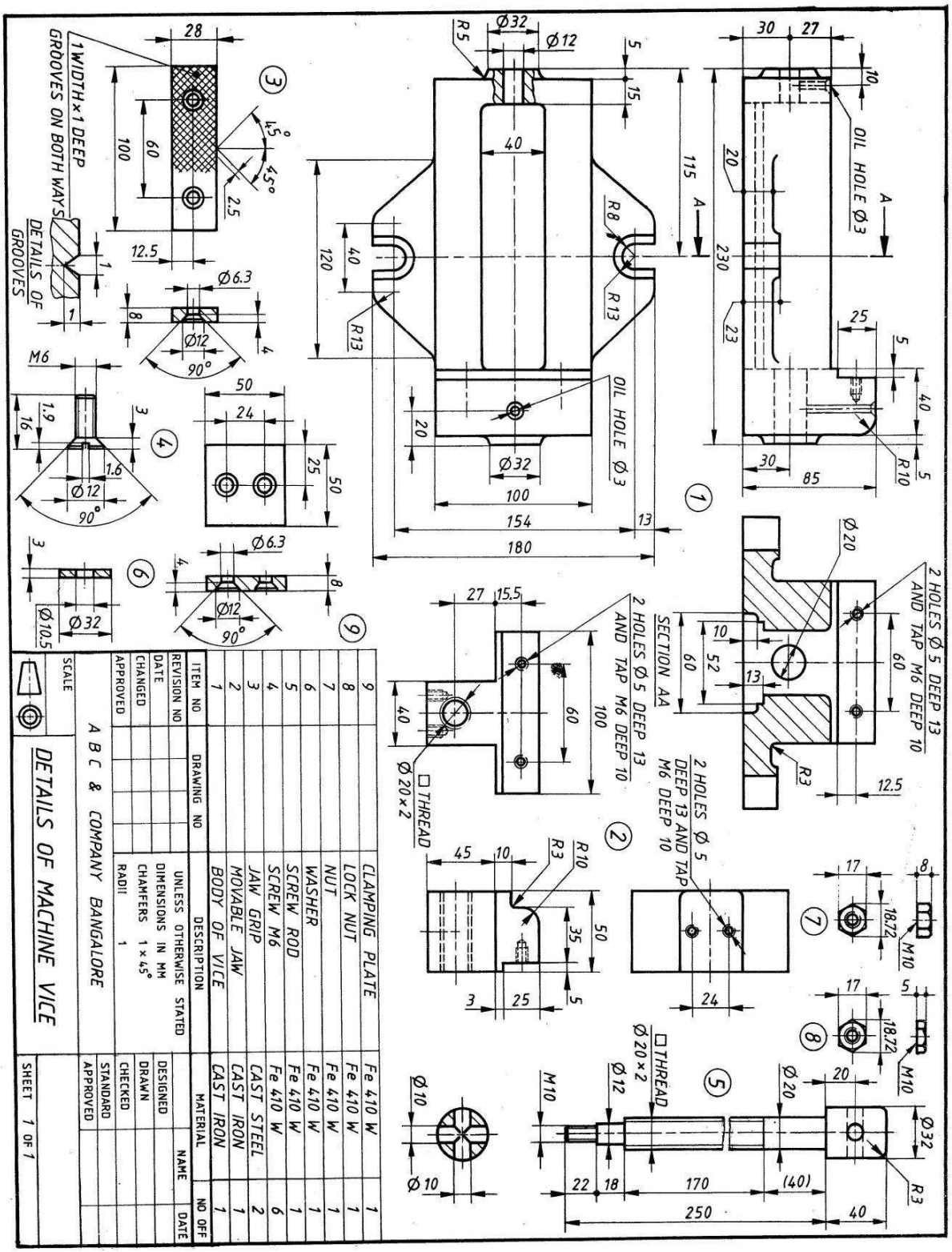


Figure 2 MACHINE VICE'

CBCS

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15ME36A/46A

Third Semester B.E. Degree Examination
(MECHANICAL)
COMPUTER AIDED MACHINE DRAWING

Time: 3 Hours **Max. Marks: 80**

Note: 1. Answer any ONE question from each of the parts A, B and C.
2. Use **FIRST ANGLE** projection only.
3. Missing data if any may suitably be assumed.
4. All the calculations should be on answer sheet supplied.
5. All the dimensions are in mm.
6. **Part C Assembled View should be in 3D and other 2 views in 2D.**

PART A

1. A right regular hexagonal pyramid with edge of base 40mm and height 100mm stands with its base on HP with two of its base edges parallel to VP. It is cut by a plane passing through a point on the axis 50mm from the base and inclined at 20o to be the horizontal plane and perpendicular to the profile plane. Project the sectional view and the true shape of section. **15 Marks**

2. Draw the following profiles.

a) ACME thread of pitch 45mm
b) External and internal BSW thread of pitch 50mm **15 Marks**

PART B

3. Draw the proportionate sketch of locking of Flanged Nut for a 20mm diameter bolt using Split Pin.

15 Marks

4. Sketch protected type Flange Coupling to connect two shafts as per the instruction given below.

(i) Half Sectional Front View (ii) Right Side View Diameter of the shaft: 25mm

15 Marks

PART C

5. Details of 'PLUMMER BLOCK' are shown in following Fgure 1. Assemble the parts and draw the following views of the assembly.

i. Sectional Front View
ii Top View **50 Marks**

6. Figure 2 shows the details of 'RAMS BOTTOM SAFETY VALVE'. Assemble the parts and draw the following views of the assembly.

i. Half Sectional Front view
ii. Top view **50 Marks**

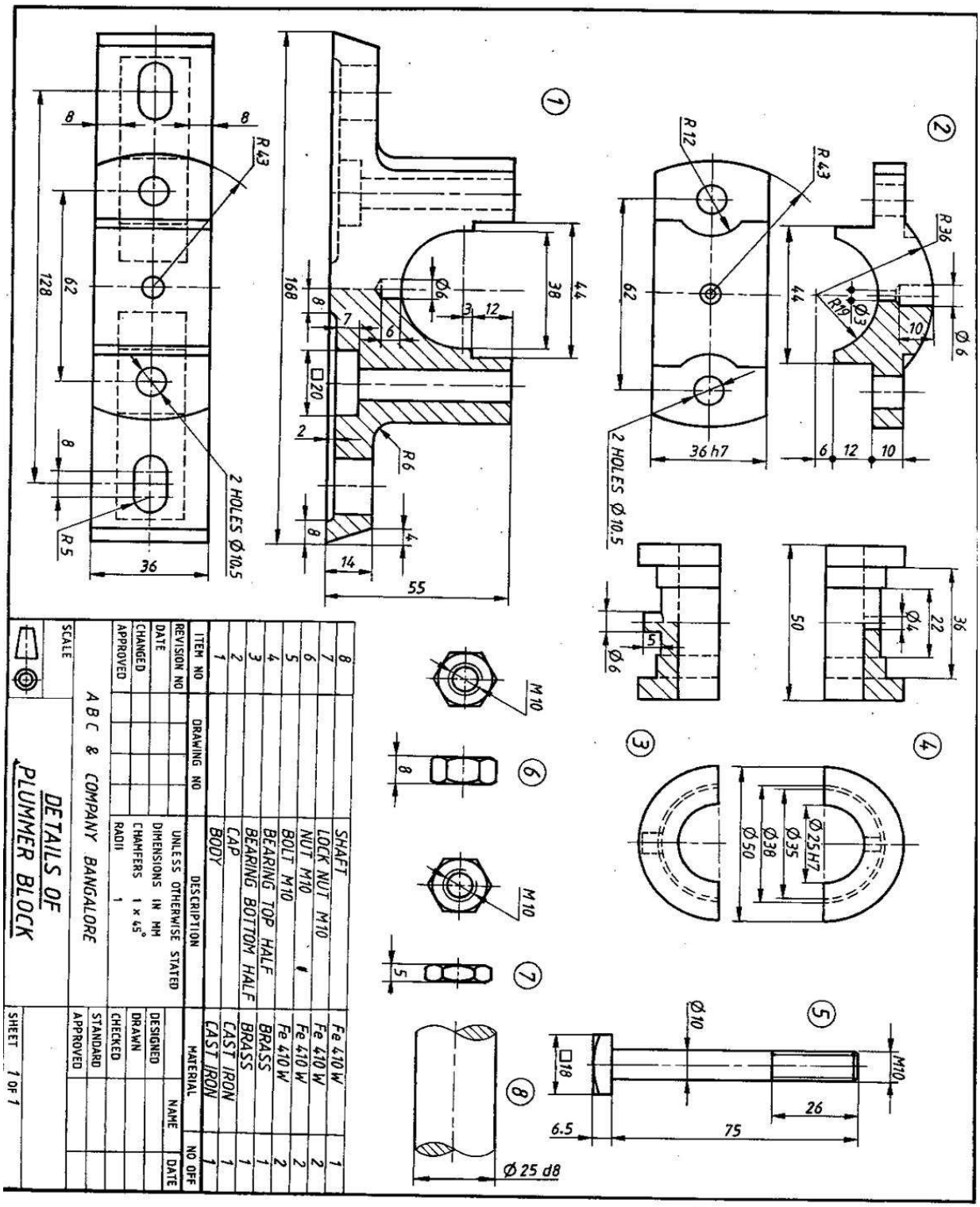
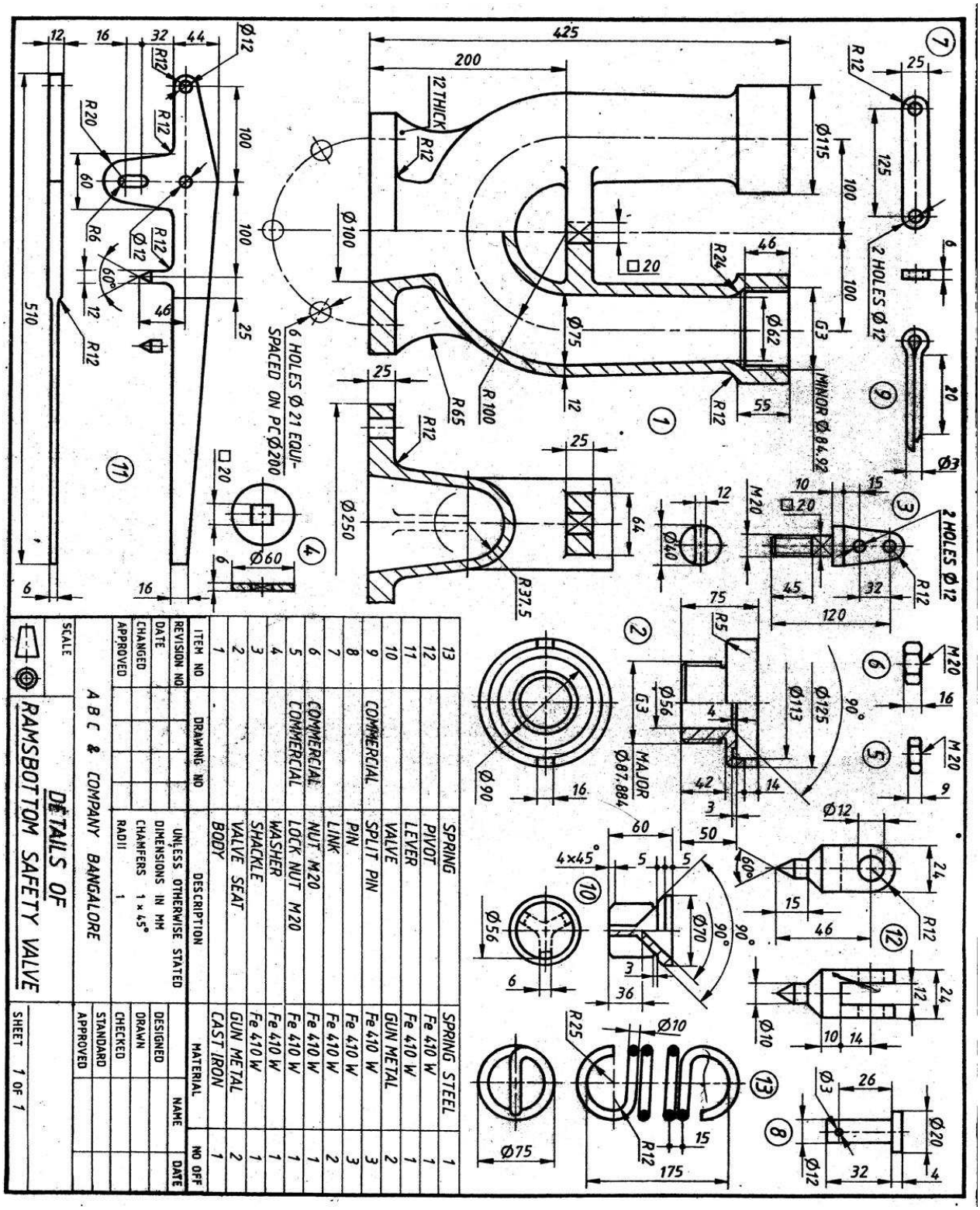


Figure 1 ‘PLUMMER BLOCK'



ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF
13		SPRING	SPRING STEEL	1
12		PIVOT	Fe 410 W	1
11		LEVER	Fe 410 W	1
10		VALVE	GUN METAL	2
9	COMMERCIAL	SPLIT PIN	Fe 410 W	3
8		PIN	Fe 410 W	3
7		LINK	Fe 410 W	2
6	COMMERCIAL	NUT M20	Fe 410 W	1
5	COMMERCIAL	LOCK NUT M20	Fe 410 W	1
4		WASHER	Fe 410 W	1
3		SHACKLE	Fe 410 W	1
2		VALVE SEAT	GUN METAL	2
1	-	BODY	CAST IRON	1

REVISION NO | DATE | CHANGED | APPROVED

UNLESS OTHERWISE STATED
DIMENSIONS IN MM
CHAMFERS 1 × 45°
RADII 1

	NAME	DATE
DESIGNED		
DRAWN		
CHECKED		
STANDARD		
APPROVED		

A B C & COMPANY BANGALORE

SCALE

DETAILS OF
RAMSBOTTOM SAFETY VALVE

SHEET 1 OF 1

Figure 2‘RAMS BOTTOM SAFETY VALVE’

CBCS

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15ME36A/46A

Third Semester B.E. Degree Examination
(MECHANICAL)
COMPUTER AIDED MACHINE DRAWING

Time: 3 Hours **Max. Marks: 80**

Note: 1. Answer any ONE question from each of the parts A, B and C.
2. Use **FIRST ANGLE** projection only.
3. Missing data if any may suitably be assumed.
4. All the calculations should be on answer sheet supplied.
5. All the dimensions are in mm.
6. **Part C Assembled View should be in 3D and other 2 views in 2D.**

PART A

1. A square pyramid of 50mm edges of base and height 70mm rests on its base on HP with one of its base edges parallel to VP. It is cut by an inclined section plane in such a way that the true shape of section is a trapezium whose parallel sides measure 40mm and 20mm. Draw the FV, sectional top view and the true shape of section. **15 Marks**

2. Draw the dimensioned sketches of the following. Indicate the proportions in terms of diameter.
(a) Flanged nut, (b) Slotted nut **15 Marks**

PART B

3. Draw the sectional Front View and the Top View of a Double Riveted Lap Joint using rivets in Zig Zag arrangements. Thickness of plates = 10 mm. Show all the dimensions on the drawing.

15 Marks

4. Draw the Sectional Front & Top View of an Oldham's Coupling to connect two shafts of diameter 30mm.

15 Marks

PART C

5. Details of 'IC ENGINE CONNECTING ROD ' are shown in following Fgure 1. Assemble the parts and draw the following views of the assembly.

i. Sectional Front View
ii Top View **50 Marks**

6. Figure 2 shows the details of 'SQUARE HEADED TOOLPOST'. Assemble the parts and draw the following views of the assembly.

i. Half Sectional Front view
ii. Top view **50 Marks**

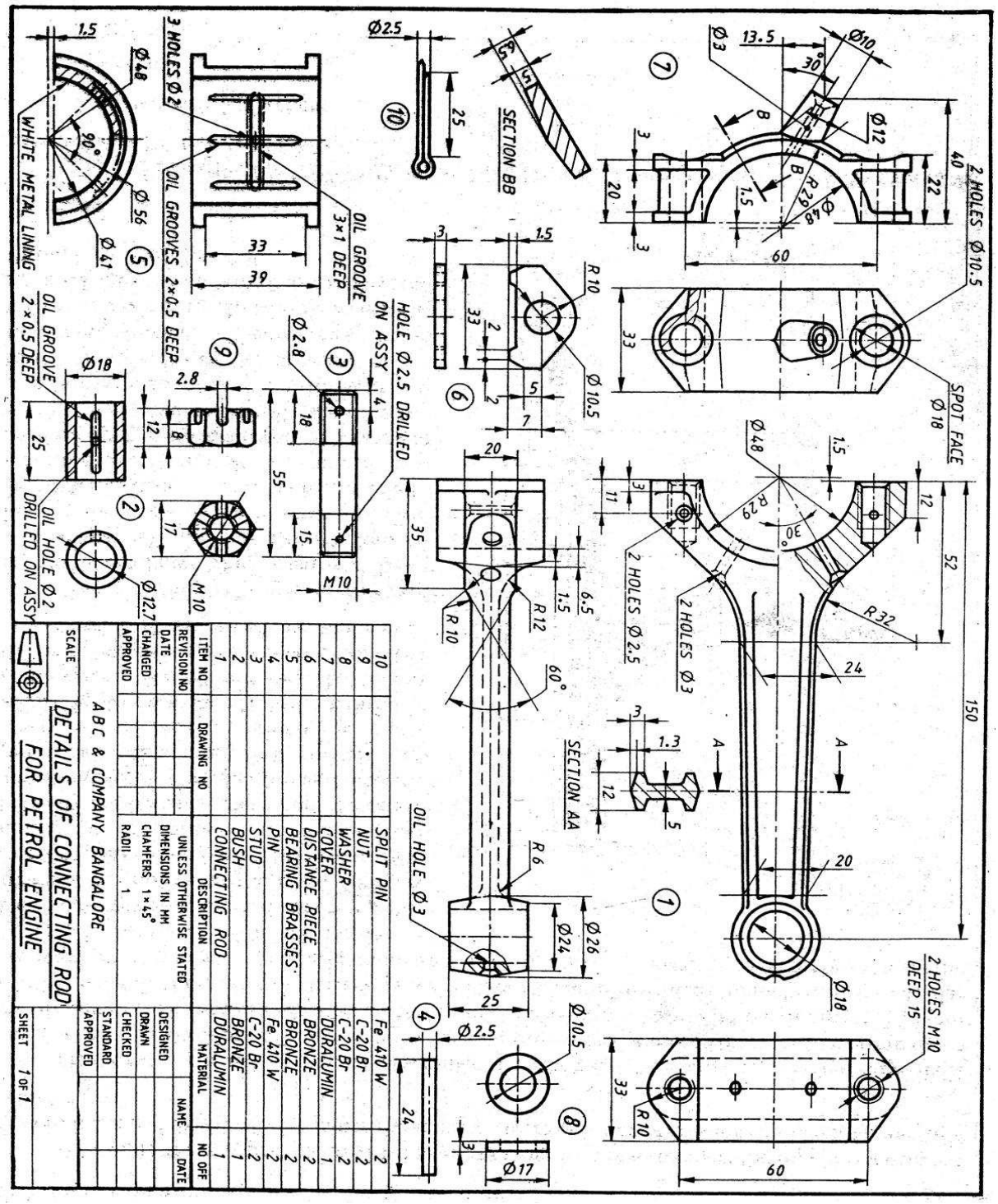

Figure 1 IC ENGINE CONNECTING ROD

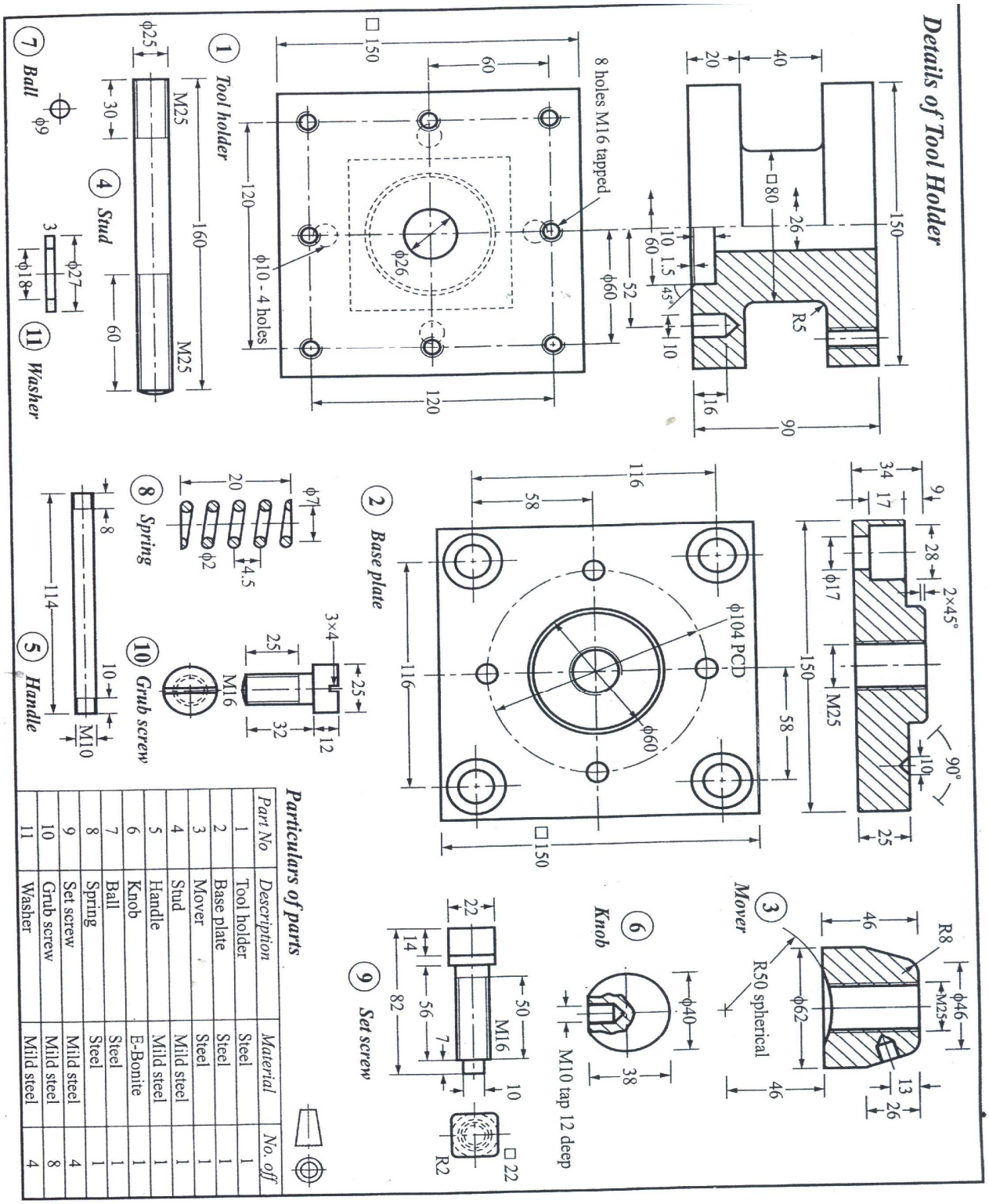

Figure 2‘SQUARE HEADED TOOLPOST’

Model Question Paper (CBCS) with effect from 2015-16

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15ME51

Fifth Semester B.E. Degree (CBCS) Examination

Management and Economics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1	**a**	Define Management. Explain the levels of Management	(06 Marks)
	b	Explain principles of management as formulated by Fayol.	(10 Marks)
		OR	
2	**a**	Explain the importance of planning.	(06 Marks)
	b	List & Explain the steps involved in planning	(10 Marks)

MODULE – II

3	**a**	Briefly Explain Maslow's Hierarchy of needs.	(08 Marks)
	b	What is span of control? Explain the factors governing it.	(08 Marks)
		OR	
4	**a**	Explain the steps involved in selection process.	(08 Marks)
	b	Define controlling. Explain the steps involved in controlling	(08 Marks)

MODULE – III

5	**a**	Differentiate between: i) Intuition and Analysis, ii) Tactics & Strategy	(06 Marks)
	b	A person is planning for his retired life. He has 10 more years of service. He would like to deposit 20% of his salary, which is Rs.4000 /- in the first year and thereafter he wishes to deposit with an annual increase of Rs.500/- for the next 9 years with interest rate of 15%. Find the total amount at the end of 10^{th} year of the above series.	(10 Marks)
		OR	
6	**a**	Explain the law of diminishing returns and its limitations	(06 Marks)
	b	An amount of Rs.1200 per year is to be paid into an account each for the next five years. Using a nominal interest of 12% determine the total amount the account will have at the end of 5^{th} year under the following conditions. (i)Deposit made at the end of each year with interest compounded monthly. (ii)Deposit made at the end of each year with interest compounded continuously.	(10 Marks)

MODULE – IV

7	**a**	State and explain the conditions for PW comparison	(06 Marks)
	b	Two types of trucks are available for transportation use. The details are as follows	(10 Marks)

Particulars	Truck A	Truck B
First Cost	8,00,000	12,00,000
Maintenance Cost	16,000	12,000
Estimated salvage value	2,00,000	4,00,000
Estimated Life	4 years	8 years

Both the truck deliver the same amount of work. Assume interest rate of 7%. Which truck is to be preferred on PW case.

OR

8 **a** Explain the two prominent methods used for comparison of assets that have unequal lives. (08 Marks)

b Investment proposals A and B have the net cash flow given below: (08 Marks)

Proposal	End of Years				
	0	1	2	3	4
A(Rs)	-10000	3000	3000	7000	6000
B(Rs)	-10000	6000	6000	3000	3000

Compare the present worth of A and B at i= 18% and which proposal should be selected.

MODULE – V

9 **a** What is depreciation? List different methods of determining depreciation. Explain any two of them. (08 Marks)

b Explain why estimation and costing is required. (08 Marks)

OR

10 **a** A CNC machine costs Rs. 40,00,000 is estimated to serve 8 years after which its salvage value is estimated to be Rs.3,50,000. Find, (08 Marks)
(i)Depreciation fund at the end of the 5^{th} year by fixed percentage method and declining balance method.
(ii)Book value of the machine after 4^{th} year and 6^{th} year by declining balance method.

b A company purchases a lathe machine for Rs.5,00,000 for operating it for 5 years at an interest rate of 5%. If the salvage value is Rs.60,000 after 5years determine, (08 Marks)
(i)Sinking fund amount
(ii)Annual depreciation cost.

Model Question Paper (CBCS) with effect from 2015-16

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15ME51

Fifth Semester B.E. Degree (CBCS) Examination

Management and Economics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1	**a**	Briefly Explain the roles of a Manager.	(08 Marks)
	b	Explain the contributions made by F.W.Taylor under Scientific Management.	(08 Marks)
		OR	
2	**a**	What are single use and standing plans? Explain them with examples.	(08 Marks)
	b	List & Explain the steps involved in Decision making.	(08 Marks)

MODULE – II

3	**a**	Define Motivation. Explain McGregor's Theory X & Theory Y	(08 Marks)
	b	Explain in Brief various types of Organization.	(08 Marks)
		OR	
4	**a**	Define Leadership. Explain the Types of Leadership.	(08 Marks)
	b	What is communication & explain the types of communication.	(08 Marks)

MODULE – III

5	**a**	Explain the Scientific approach of problem solving and decision making.	(10 Marks)
	b	Find the effective interest rate if the rate of interest is 8% when compounded (i) Yearly (ii) Biannually (iii) Quarterly (iv) Monthly (v) Daily. Compare the results.	(06 Marks)
		OR	
6	**a**	An inventor has been offered Rs.12,000 per year for next 5 years and Rs.6,000 annually for the following 7 years for the exclusive rights to an invention. At what price could the inventor afford to sell the rights to earn 10% disregarding taxes.	(10 Marks)
	b	Explain the law of Demand and Supply with suitable example	(06 Marks)

MODULE – IV

7	**a**	Define the following terms: (i) Service Life (ii) Accounting Life (iii) Economic Life	(06 Marks)
	b	Compare the alternatives below using present worth analysis at i = 10% per year and a 3 year study period	(10 Marks)

Particulars	Machine A	Machine B
First cost	Rs.20,000	Rs.30,000
Annual cost	Rs. 9,000	Rs. 7,000
Salvage / Market value	Rs. 4,000	
Life	3 Years	6 Years

OR

8 **a** Explain future worth comparison method. How is it different from present worth comparison method (06 Marks)

b First cost of an asset is Rs 5,00,000/-. The annual maintenance in the first year is Rs 2,000/- and increase by Rs 1,000/- every year up to 10^{th} year. The annual income is expected to be Rs 50,000/- in the first year with increase of Rs 25,000 every year up to 10^{th} year. The operating cost is Rs 6,000/- per year. The salvage value is Rs 30,000/- at the end of 10^{th} year. Find the equivalent annual cost of the machine at 12% interest rate. (10 Marks)

MODULE – V

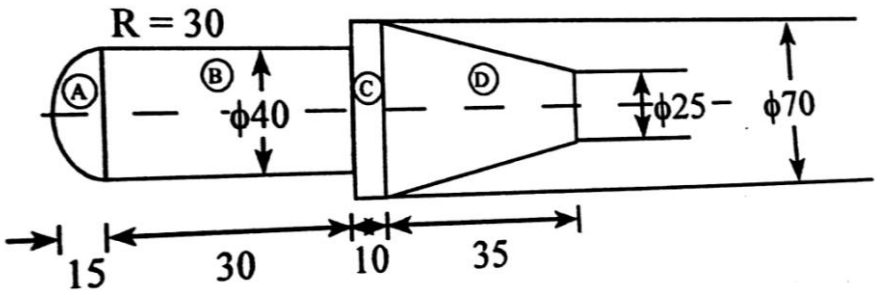
9 **a** Explain the following terms (08 Marks)
(i)Prime cost (ii) Factory Cost (iii) Office cost (iv) Total Cost

b A small firm is producing 1000 pens per day. The cost of direct material is Rs.1600 and that of direct labour is Rs.2000. Factory overheads chargeable to it are Rs.2500. If the selling on cost is 40% of the factory cost, what must be the selling price of each pen to realize a profit of 20% of the selling price. (08 Marks)

OR

10 **a** Explain the causes of depreciation (08 Marks)

b Determine the weight and the cost of following component shown in fig. Take density of material 8.5g/cc. cost of each Kg of material is Rs.100. (08 Marks)



Model Question Paper (CBCS) with effect from 2015-16

15ME52

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Fifth Semester B.E. Degree (CBCS) Examination

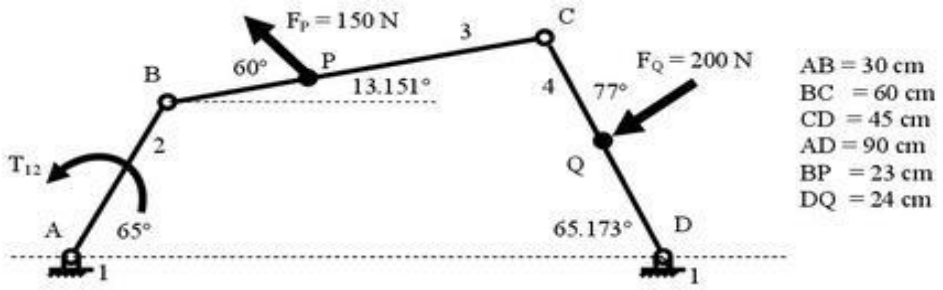
Dynamics of Machinery

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** Calculate T2 and various forces on links for the equilibrium of the system shown in fig. (16 Marks)



OR

2 **a** Explain Dynamic force analysis, Alembert's principle, Inertia force and Inertia torque. (08 Marks)

b When the crank is 45^0 from the inner dead center on the down stroke, the effective steam pressure on the piston of a vertical steam engine is 2.5bar. the diameter of the cylinder = 0.75 m, stroke of the piston = 0.50 m and length of connecting rod=1 m. determine the torque on the crank shaft if the engine runs at 350 rpm and the mass of reciprocating parts is 200kg. (08 Marks)

MODULE – II

3 **a** A 3.6 m long shaft carries 3 pulleys, two at its two ends and the third at the midpoint. The two end pulleys have masses 79 Kg and 40 Kg with their radii 3 mm and 5 mm from the axis of the shaft respectively. The middle pulley has a mass of 50 Kg with radius 8 mm. The pulleys are so keyed to the shaft that the assembly is in static balance. The shaft rotates at 300 rpm in two bearings 2.4 m apart with equal overhangs on either side. Determine (i) Relative angular positions of the pulleys, (ii) Dynamic reaction on the bearings. (16 Marks)

OR

4 **a** Prove that the resultant unbalanced force is minimum when half of the reciprocating masses are balanced by rotating masses i.e., when c = 1/2 (04 Marks)

b The firing order in a 6 cylinder vertical 4 stroke in line engine 1-4-2-6-3-5, the piston stroke is 100 mm. length of each C.R = 200 mm. the pitch distance between cylinder centerlines are 100 mm, 100 mm, 150 mm, 100 mm and 100mm. determine the out of balance primary and secondary forces and couples on this engine taking a plane midway between cylinders 3 and 4 as reference plane. The reciprocating mass per cylinder is 2kg and the engine runs at 1500 rpm. (12 Marks)

MODULE – III

5	a	Define the following terms with respect to Governors: Sensitiveness, Stability, Isochronism, Hunting, Governor effort, Governor power.	(04 Marks)
	b	In a porter governor the arms and links are each 10 cm long and intersect on the main axis. Mass of each ball is 9 Kg and the central mass is 40 Kg. When sleeve is in its lowest position the arms are inclined at 300 to the axis. The lift of the sleeve is 2 cm. What is the force of friction at the sleeve, If the speed at the beginning of ascend from the lowest position is equal to the speed at the beginning of descend from the highest position. What is the range of speed of governor, if all other things remain same.	(12 Marks)

OR

6	a	Derive an expression for gyroscopic couple.	(06 Marks)
	b	A four wheeler trolley car weighing 25kN runs on rails which are 1.5 m apart and travels around a curve of 30 m radius at 24 km/hr. the rails are at the same level, each wheel of the trolley is 7.5 cm in diameter and each of two axels is driven by a motor running in direction opposite to that of wheels at a speed of 5 times the speed of rotation of wheel. The M.I of each axel with gear and wheel is 18 kgm^2. Each motor shaft with pinion has M.I of 12 kgm^2. C.G of car is 90 cm above rail. Determine the vertical force exerted by each wheel on the rail taking into consideration of centrifugal and gyroscopic effect. State the centrifugal and gyroscopic effect of the trolley.	(10 Marks)

MODULE – IV

7	a	Define the fallowing terms i) Simple Harmonic motion ii) Resonance iii) Degrees of Freedom iv) Natural Frequency v) Time Period	(06 Marks)
	b	Split the Harmonic function $X= 5 \sin(\omega t + \pi/4)$ into two Harmonic functions one having phase of zero and the other of 600.	(10 Marks)

OR

8	a	Derive differential equation for undamped free vibrations. (Newton's method).	(06 Marks)
	b	Determine the natural frequency of a spring mass system where the mass of is also to be taken in to account.	(10 Marks)

MODULE – V

9	a	Define logarithmic decrement and derive an expression for the same.	(06 Marks)
	b	The disc of a torsional pendulum has a moment of inertia of 0.06kgm^2 and is immersed in viscous fluid. The brass shaft attached to it is of 100 mm diameter and 400 mm long when the pendulum is vibrating, the amplitude on the same side for the successive cycles are 9^0, 6^0, and 4^0. Determine (i) logarithmic decrement (ii) damping torque at unit velocity (iii0 periodic time of vibration. Assume for brass shaft G= 4.4×10^{10} N/m^2. What would be the frequency if the disc is removed from the viscous fluid.	(10 Marks)

OR

10	a	Define magnification factor, vibration isolation and transmissibility ratio.	(06 Marks)
	b	A mass of 6kg suspended by a spring of stiffness 1180 N/m is forced to vibrate by the harmonic force 10N. Assuming viscous damping coefficient of 85 Ns/m, determine the resonant frequency, amplitude at resonance, phase angle at resonance, frequency corresponding to the peak amplitude and the phase angle corresponding to peak amplitude.	(10 Marks)

Model Question Paper (CBCS) with effect from 2015-16

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15ME52

Fifth Semester B.E. Degree (CBCS) Examination

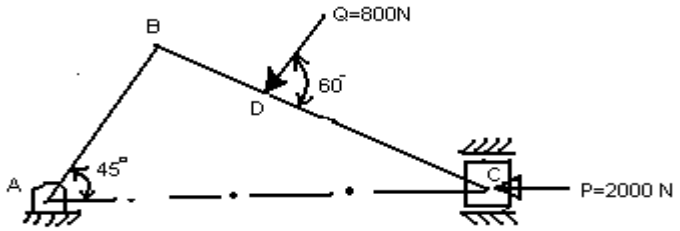
Dynamics of Machinery

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

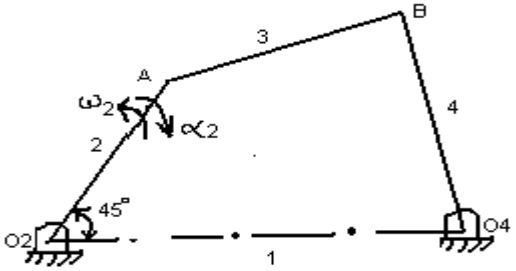
MODULE – I

1 **a** Determine the various forces on the links and couple T2 in the fig (16Marks)
AB = 300 mm , BC = 600 mm , BD=200 mm



OR

2 **a** A four bar mechanism is shown in fig. The center of gravity of each link is at its midpoint. Length of links O_2O_4 = 500mm, O_2A = 250 mm, O_4B = 300 mm, AB = 300 mm. Mass of links O_2A = 1.52 kg, AB = 3.06 kg, O_4B = 5.09 kg. Mass moment of inertia of links O_2A = 0.012 kg-m², AB = 0.012 kg-m², O_4B = 0.012 kg-m². Find the inertia forces on each link. (16Marks)



MODULE – II

3 **a** Explain analytical method of balancing of several masses in same plane (04 Marks)

b A Shaft running in bearings carries masses 20, 30, 40 Kg in planes A, B and C with C.G from the Axis of the shaft 30 mm, 20 mm and 15 mm respectively. The Distances of planes B and C from A are 1000 mm and 2000 mm to the right of A. The relative angular positions of the unbalanced masses are such that they are in static balance. To obtain complete dynamic balance suitable masses are introduced in planes D and E with C.G 100 mm from the axis. D is 500 mm to the left of A and E is 500 mm to right of C. Determine the position and magnitude of the balancing masses. (12 Marks)

OR

4 **a** With usual notations, Explain primary and secondary unbalanced forces of reciprocating masses (04 Marks)

b A 5 masses Cylinder inline engine running at 500 rpm has successive cranks at 144^0 apart. The distance between the cylinder centre line is 300 mm. Piston stroke=240 mm. Length of CR = 480 mm. Examine the engine for balance of primary and secondary forces and couples. Find the maximum value of these and position of central crank at which these maximum values occur. The reciprocating mass for balance each cylinder is 150 N. (12 Marks)

MODULE – III

5 **a** Derive expression for Governor Effort for K=1 (04 Marks)

b A porter governor has equal arms each 300mm long & pivoted on the axis of rotation. Each ball has a mass of 5 kg & the mass of the sleeve is 15 kg. The radius of rotation of the ball is 200 mm when the governor begins to lift & 250 mm when the governor is at maximum speed. Find the range of speed (12 Marks)

a. When the friction at the sleeve is neglected
b. When the friction at the sleeve is equivalent to 30 N

OR

6 **a** With neat sketches, explain the effect of gyroscopic couple on steering, pitching and rolling of ship. (06 Marks)

b A rear engine automobile is travelling along a track of 100 m radius. Each of the four wheels has a moment of inertia of 2 kgm2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.25 kgm2. The engine axis is parallel to the rear axle and the crank shaft rotates in the same direction as the wheels. The gear ratio of engine to back axle is 3:1. The automobile mass is 1500 kg and its centre of gravity is 0.5 m above the road level. The width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all the wheels to maintain contact with the road surface. (10 Marks)

MODULE – IV

7 **a** Add the fallowing motions analytically (06 Marks)

$X1 = 3 \sin(\omega t + 30^0)$ $X2 = 4 \cos(\omega t + 10^0)$

b The motion of a particle is $X = 5 \sin \omega t$ .Show the relative positions and magnitudes of the displacement, velocity and acceleration vectors at time t = 0 wheni) Ω=0.5 rad/sec, ii) Ω=1 rad/sec, iii) Ω=2 rad/sec (10 Marks)

OR

8 **a** Using Energy Method Derive differential equation for undamped free vibrations. (06 Marks)

b A block of mass 0.05 Kg is suspended from spring having stiffness of 25 N/m. The block is displaced downwards from its equilibrium position through a distance of 2 cm and released with an upward velocity of 3 cm/sec. Determine i) Natural Frequency ii) Period of oscillation iii) Maximum Velocity iv) Maximum Acceleration v) Phase angle. (10 Marks)

MODULE – V

9 **a** Explain the fallowing i)Critical Damping ii) Damping ratio iii) logarithmic decrement iv) Damped natural Frequency (08 Marks)

b A mass of 7.5 Kg hangs from a spring and makes damped oscillations. The time for 60 oscillations is 35 secs and the ratio of seventh displacement is found to be 2.5. Find i) Stiffness of spring ii) Damping Resistance iii) If the oscillations were critically damped what is the damping resistance. (08 Marks)

OR

10 **a** Explain the fallowing i) Viscous Damping ii) Coulomb Damping iii) Structural Damping (06 Marks)

b A vibrating body is supported by six isolators each having stiffness 32000 N/m and 6 dash pots each have 400 N-s/m. The vibrating body is to be isolated by a rotating device having an amplitude of 0.06 mm at 600 rpm. Take m=30 Kg. Determine the amplitude of vibration of the body and dynamic load on each isolator. (10 Marks)

Model Question Paper (CBCS) with effect from 2015-16

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15ME53

Fifth Semester B.E. Degree (CBCS) Examination

Turbomachines

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** Define turbomachine. Compare positive displacement machines and turbomachines. (08Marks)

b A Pelton wheel is running at a speed of 200 rpm and develops 5200kW of power when working under a head of 220m with an overall efficiency of 80%. Determine its unit speed, unit discharge, unit power and specific speed. (08Marks)

OR

2 **a** Show that for expansion process, stage efficiency is higher than overall efficiency. (08Marks)

b Find the number of stages of an axial flow compressor with symmetrical balding in order to produce a total pressure rise from 1bar to 4bar. The blade height is 3cm, the mean diameter is 100cm, mean speed of the rotor is 2400rpm and the stage efficiency is 82%. (08Marks)

MODULE – II

3 **a** Derive an alternate form of Euler Turbine equation. (08 Marks)

b In an axial flow turbine the discharge blade angles are 20° each for both the stator and the rotor. The steam speed from the nozzle exit is 140m/s. The ratio of Va/U = 0.7 at the entry and 0.76 at the exit of the rotor blade. Find the rotor inlet blade angle and the power developed by the blade ring for a mass flow rate of 2.6kg/s. (04 Marks)

OR

4 **a** For an axial flow compressor, derive an expression for degree of reaction. (08 Marks)

b In a radial inward flow turbine the degree of reaction is 0.8 and the utilization factor of the runner is 0.9. The tangential speeds of the wheel at the inlet and the outlet are respectively 11m/s and 5.5m/s. Draw the velocity triangles at inlet and outlet assuming radial velocity is constant and equal to 5m/s. Flow is radial at exit. Find the power output for a volumetric flow rate of $2m^3$ of water per second. (10 Marks)

MODULE – III

5 **a** Define compounding. List different methods of compounding. With a neat sketch explain velocity compounding of steam turbine. (08 Marks)

b. A single wheel impulse steam turbine has equiangular rotor blades that develop 3.75kW and produce a torque in the disc of 1.62N-m at a mean radius of 132.5mm. The rotor receives 0.014kg/s of steam from nozzles inclined at 70° to the axial direction and steam discharges from the wheel chamber in an axial direction. Find (a) the blade angles, (b) the diagram efficiency. (08 marks)

OR

6 **a** Derive an expression for degree of reaction of a reaction steam turbine. (08 Marks)

b Find the blade of a two stage velocity compounded axial flow steam turbine from the following data:
i) Rotor blade angles = 30°, ii) Absolute velocity of steam entering the first stage = 500m/s, iii) Discharge is axial at the second stage (08 Marks)

MODULE – IV

7 **a** With a neat sketch, explain the working principle of Francis turbine. Write the functions of draft tube. (08 Marks)

b A medium Francis runner has a diameter of 75cm and with of 10cm. Water leaves the guide vanes at a velocity of 16m/s inclined at 25° with the runner periphery. The net head is 20m. The overall and hydraulic efficiencies are 80% and 90% respectively. Assuming that 8% of the flow area is lost due to the runner vanes thickness. Calculate the runner vane angle at inlet, power output by the runner and speed of the machine. (08 Marks)

OR

8 **a** Derive an expression for the work on the vane of Pelton turbine. (08 Marks)

b A Kaplan turbine produces 10Mw at a head of 25m. The runner and the hub diameters are 3m and 1.2m respectively. The inlet and outlet velocity triangles are right angles triangles. Calculate the speed and outlet angles of the guide and runner blades if the hydraulic and overall efficiencies are 96A% and 85% respectively. (08 Marks)

MODULE - V

9 **a** Derive an expression for energy transfer and discharge. Plot the variation of Energy transfer with discharge. Discuss the effect with respect to the discharge angle. (08 Marks)

b A centrifugal pump is required to lift 910lit/s of water against 6m when running at 500rpm. The velocity of flow through the wheel is 2m/s and the manometric efficiency is 60%. The angle of the vane tip makes with the direction of the motion is 30°. Determine the diameter and width of the impeller. (08 Marks)

OR

10 **a** Explain i) Cavitation, ii) Net Positive Suction Head, iii) Priming, iv) Manometric Head. (08 Marks)

b The following data refers to a centrifugal pump: (i) Both angle at the impeller exit = 30°, ii) Outer diameter of the impeller = 0.6m, (iii) inner diameter of the impeller = 0.25m, iv) width of the impeller at the exit = 8cm, (v) width of the impeller at the inlet = 12.5cm, (vi) speed = 400rpm, vii) discharge = 6780lit/min. Find the theoretical head developed in kW and the blade angle at the impeller entry. (08 Marks)

Model Question Paper (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15ME53

Fifth Semester B.E. Degree (CBCS) Examination

Turbomachines

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** Define turbomachine. Give a comparison between turbomachines and positive displacement machines (08 Marks)

b A single stage centrifugal pump works against a height of 30m, running at 2000rpm, supplies $3m^3/s$ and has an impeller diameter of 300mm. Calculate (a) the number of stages and (b) the diameter of each impeller required to pump $6m^3/s$ of water to a height of 220m when running at 1500rpm. (08 Marks)

OR

2 **a** Define total to total, total to static, static to static and static to total efficiencies for power developing and power consuming turbomachines and write the T-s Diagrams. (08 Marks)

b Total to total efficiency for a power absorbing turbomachine handling liquid water of standard density is 70%. Suppose the total pressure of water increased by 4 bar, evaluate (a) the isentropic change in total enthalpy (b) the actual change in total enthalpy (c) the change in total temperature of the water and (d) the power input to the water, flow rate is 30kg/s. (08 Marks)

MODULE – II

3 **a** In a certain turbomachine, the blade speed at exit is twice that at inlet ($u_2=2u_1$), the meridian component of fluid velocity at inlet is equal to that at exit and the blade angle at inlet is 45^0. Show that the energy transfer per unit mass and degree of reaction are given by $\frac{E}{m} = -2V_{m1}^2(2 - cot\beta_2)$ $and\ R = \frac{(cot\beta_2+2)}{4}$ (08Marks)

b At a stage of 50% reaction axial flow turbine running at 3000 rpm, the mean blade diameter is 68.5 cm. If the maximum utilization factor for the stage is 0.915, Calculate (a) the inlet and outlet absolute velocities and (b) the power output. Also, find the power developed for a steam flow rate of 15 kg/s. (08 Marks)

OR

4 **a** Derive the theoretical head capacity relation in case of centrifugal pump $H = \frac{U_2^2}{g_c} - \frac{U_2^2 Q cot\beta_2}{A_2 g_c}$. Discuss the effect of blade angle at outlet on head. (08 Marks)

b Draw the inlet and outlet triangles for an axial flow compressor for which given (1) Degree of reaction =0.5 (2) inlet blade angle $=40^0$ axial velocity of flow which is constant throughout = 125m/s (4) RPM =6500 (5) Radius = 0.2m. Calculate the power required in kW at an air flow rate = 15kg/s. Find fluid angles at inlet and outlet. Blade speed is same at exit and inlet. (08Marks)

MODULE – III

5 **a** Derive the condition for maximum efficiency of an impulse turbine and show that the maximum efficiency is $\cos^2\alpha$. (08 Marks)

b Steam issues from nozzle to a de Laval turbine at a velocity of 1000m/s. The nozzle angle is 20^0. The mean blade velocity is 400m/s. the blades are symmetrical. The mass flow rate is 1000kg/h, friction factor is 0.8, and nozzle efficiency is 0.95. Calculate Blade angle, Axial thrust, and Power developed, Blade efficiency, Stage efficiency. (08 Marks)

OR

6 **a** Show that the maximum diagram efficiency of a stage of a reaction turbine is given by the expression $\emptyset = \frac{2cos^2\alpha_1}{1+cos^2\alpha_1}$ (08 Marks)

b In a Curtis steam turbine stage there are two rows of moving blades with equiangular rotors. Steam enters the first rotor at an angle of 20^0 each and the second rotor at an angle of 32^0 each. The absolute velocity of steam as it enters the first rotor is 530m/s and the blade velocity coefficient is 0.9 in the first rotor, 0.91 in stator, and 0.93 in the second rotor. If the final discharge should be axial, Compute (a) the power output for a steam flow rate of 3.2kg/s and the axial thrust. (08 Marks)

MODULE – IV

7 **a** Derive an expression for maximum efficiency of a pelton wheel. (08 Marks)

b A Pelton wheel has a water supply rate of $5m^3/s$ at a head of 256m and runs at 500rpm. Assuming a turbine efficiency of 0.85, a coefficient of velocity for nozzle as 0.985, speed ratio of 0.46, calculate (a) the power output, (b)the specific speed.

OR

8 **a** With a neat sketch explain the working principle of Kaplan turbine. (08 Marks)

b An inward flow reaction turbine with a supply of $0.6m^3/s$ under a head of 15m develops 75kw at 400 rpm. The inner and outer diameter of the runner are 40cm and 65cm respectively. Water leaves the exit of the turbine at 3m/s calculate the hydraulic efficiency and the inlet blade angles. Assume radial discharge and width to be constant.

MODULE –V

9 **a** Explain the phenomenon of cavitation in a centrifugal pump? What are the effects? How do you prevent cavitation? (08 Marks)

b A centrifugal pump delivers 50l/s of water per second against a total head of 24m at 1500 rpm. The velocity of flow is maintained constant at 2.4 m/s and blades are curved backward at 30^0 to tangent at exit. The inner diameter is half of the outer diameter, if the Manometric efficiency is 80%. Find the blade angle, and power required to pump. (08 Marks)

OR

10 **a** Draw a sketch of an axial flow compressor with inlet guide vane and explain the working principle of the compressor (08 Marks)

b An air compressor has eight stages of equal pressure ratio 1.35. The flow rate through the compressor and its overall efficiency are 50kg/s and 82% respectively. If the conditions of air at entry are 1.0bar and 400c Determine a) the state of air at the compressor exit b) polytropic efficiency (08 Marks)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Model Question Paper - 2 (CBCS) with effect from 2015-16

USN | | | | | | | | | | |

15ME54

Fifth Semester B.E. Degree (CBCS) Examination

Design of Machine Elements - 1

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Any data missing may be suitably assumed.
3. Use of Design Data Hand Book is permitted.

MODULE – I

1 **a** What are important properties of materials that are to be considered while selecting a material? (8 Marks)

b A cantilever beam of circular cross section and 1 m long is subjected to a transverse load of 30 kN at its free end and an axial load of 60 kN. Find suitable diameter of the rod taking the allowable normal stress as 10 MPa. (8 Marks)

OR

2 **a** Explain with neat sketches any four cases how to reduce stress concentration in machine members. (8 Marks)

b A stepped shaft with a step ratio 2 and a fillet radius of 10 % of the smaller radius is required to transmit 30kW at 1200 rpm. The allowable shear stress for the material is 60 MPa. Taking stress concentration into account, find the size of the shaft. (8 Marks)

MODULE – II

3 **a** Derive the equation for axial impact stress. (8 Marks)

b A free end of a cantilever beam of rectangular cross section having depth 200 mm and length 1200 mm, is struck by a weight of 10 kN that falls on to it from a height of 20 mm. The maximum instantaneous is to be limited to 120 MPa. Find suitable width of the cross section. (8 Marks)

OR

4 **a** Derive Soderberg's equation for fluctuating loads. (6 Marks)

b A connecting rod is subjected to an axial load that fluctuated from 120 kN tension to 60 kN compression. The material has a yield stress of 360 MPa and normal endurance stress o 300 MPa. Taking factor of safety as 2.1, find suitable diameter of the connecting rod. (10 Marks)

MODULE – III

5 A solid shaft 900 mm long between bearings receives 18 kW of power at 900 rpm through a 20^0 involute spur gear of diameter 200 mm, located at 200 mm to the left of left bearing. It is driven by another gear with downward tangential force. The power is transmitted by a 400 mm diameter pulley downward at an angle of 45^0 to horizontal. The pulley is located at 300 mm to the left of right bearing. The tensions' ratio is 3. Find suitable diameter of the shat taking the allowable tensile and shear stresses as 100 MPa and 60 MPa. (16 Marks)

OR

6 **a** Design a cotter joint to connect two round rods and to sustain an axial load of 120 kN. The allowable stresses are 100 MPa in tension, 70 MPa in shear and 150 MPa in crushing. (10 Marks)

b Design a solid flange coupling of marine type to transmit 8.4kW at 400 rpm. The allowable shear stress for the shaft and bolts may be taken as 60 MPa and allowable crushing stress for key may be taken as 110 MPa. (6 Marks)

MODULE – IV

7 **a** Design a double riveted double cover butt joint to connect two plates of 20 mm thick. The allowable stresses are 90 MPa in tension, 60 MPa in shear and 150 MPa in crushing. (8 Marks)

b Find the suitable diameter for the riveted joint loaded as shown in fig Q7(b). The allowable stresses are 90 MPa in tension, 60 MPa in shear and 150 MPa in crushing.

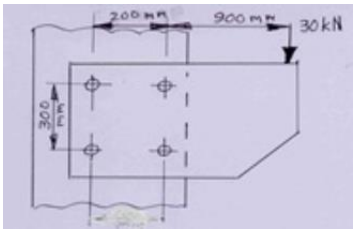

Fig Q 7(b)

(8 marks)

OR

8 **a** What are the advantages of welded joints over riveted joints? (6 Marks)

b Find the size of the weld for a joint loaded as shown in fig 8 (b). The allowable stress in the weld may be taken as 75 MPa. (10 Marks)

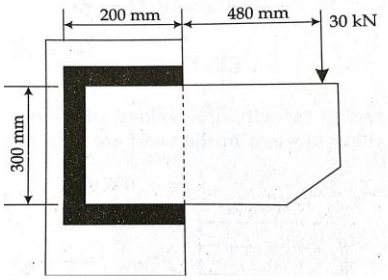

Fig Q 8(b)

MODULE – V

9 **a** A M20 x 2 steel bolt of length 100 mm is subjected to an impact load. The energy absorbed by bolt is 2 N-m. Find the stress in the bolt if the entire length of bolt is threaded. (06 Marks)

b The cylinder head of a steam engine is subjected to a steam pressure of 0.9 MPa. It is held in position by means of 6 bolts. The diameter of the cylinder is 420 mm. The allowable stress in the bolt is 90 MPa. Find the diameter of the bolt for the following cases: (10 Marks)

(i) Metal to metal joint.

(ii) A soft copper gasket is used to make the joint leak proof.

OR

10 **a** Derive the expression for efficiency of a square threaded power screw. (06 Marks)

b A trapezoidal threaded screw 40 mm diameter and 7 mm pitch, propels a load of 12 kN at a speed of 1.4 m / min. The end of screw is mounted on a thrust collar of 30 mm inside diameter and 60 mm outside diameter. The coefficient of thread friction is 0.12 and for collar is 0.15. Find (10 Marks)

(i) The power of motor required to drive the screw and

(ii) The efficiency of the screw.

Model Question Paper (CBCS) with effect from 2015-16

15ME54

USN | | | | | | | | | | |

Fifth Semester B.E. Degree (CBCS) Examination

Design of Machine Elements-1

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing one full question from each module.
2. Use of Design Data Hand Book permitted.
3. Any missing Data may be assumed suitably.

MODULE – I

1 **a** Explain codes and Standards in Design with Suitable examples. (06 Marks)

b A machine member is subjected to a twisting moment of 2 kNm and a bending moment of 4kNm.Find Suitable diameter of the shaft if the normal and shear stresses are 120MPa and 75MPa respectively. (10 Marks)

OR

2 **a** Define Stress Concentration and give Three examples of how to reduce Stress Concentration. (08 Marks)

b Find the Thickness of a flat plate as shown in the Fig Q2(b) subjected to a tensile load of 90kN.The allowable stress for the plate material is 120 MPa. (08 Marks)

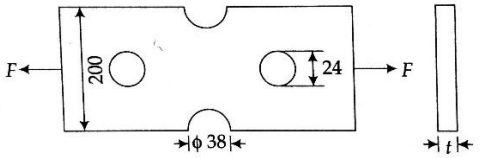

Fig Q2(b)

MODULE – II

3 **a** Derive Equation for Impact Stress in Axial Load. (07 Marks)

b A bar of rectangular cross section with sides ratio as 2 is 300 mm long. It is subjected to an axial impact by a load of 1.5kN that fall on it from a height of 12 mm. Determine the dimensions of the bar if the allowable stress is 120 MPa. (09 Marks)

OR

4 **a** Derive Soderberg's Equation (06 Marks)

b A round rod of diameter 1.2d is reduced to a diameter d with a fillet radius of 0.1d.This stepped rod is to sustain a twisting moment that fluctuates between +2.5kN-m and +1.5kN-m together with a bending moment fluctuates between +1kN-m and -1kN-m. The rod is made of carbon steel (σ_y = 330 MPa and σ_u = 620 MPa). Determine the diameter 'd'. Take load factor = 1 for bending and 0.6 for torsion, size factor and surface finish factors = 0.85 and factor of safety =2.0. (10 Marks)

MODULE – III

5 **a** A solid steel shaft running at 600 rpm is supported on bearings 600 mm apart. The shaft receives 40kW through a 400 mm diameter pulley weighing 400N located 300mm to the right of left bearing by a vertical flat belt drive. The Power is transmitted from the shaft through another pulley of diameter 600mm weighing 600N located 200 mm to the right of right bearing. The belt drives are at right angles to each other and ratio of belt tensions is 3.0. Design the shaft if the allowable shear stress in the shaft material is 40 MPa while taking steady loads. (16 Marks)

OR

6 **a** Classify keys and show that square key is equally strong in shear and compression. (08 Marks)

b Design a protected type cast iron flange coupling for a steel shaft transmitting 30 kW at 200 rpm. The allowable shear stress in the shaft and key material is 40 MPa. The maximum Torque transmitted to be 20% greater than the full load torque. The allowable shear stress in the bolt is 60 MPa and allowable shear stress in the flange is 5 MPa. (08 Marks)

MODULE – IV

7 **a** Explain Various strengths of Riveted Joints (04 Marks)

b Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5m in diameter subjected to a steam pressure of 1MPa. Assume an efficiency of 75%, allowable stress in the plate and rivets as 90 MPa (Tension), 140 MPa (crushing) and 56 MPa (shear) respectively. (12 Marks)

OR

8 **a** Two plates are joined by means of Fillet welds as shown in Fig 8(a). The leg dimensions of the welds is 10 mm and permissible shear stress at the throat cross section is 75 MPa. Determine the length of each weld. (06 Marks)

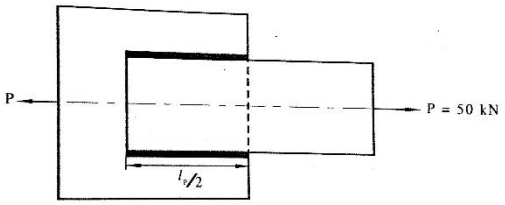

Fig Q8(a)

b A Welded connection of steel plates is as shown in Fig Q8 (b). Determine the throat dimensions of weld, if the allowable stress is 90 MPa. (10 Marks)

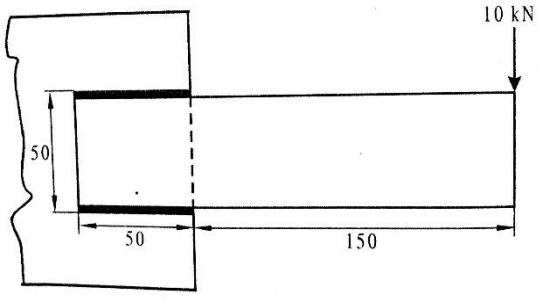

Fig Q8(b)

MODULE – V

9 **a** A bolt in a steel structure is subjected to a tensile load of 9 kN. The initial tightening load on the bolt is 5kN. Determine the size of bolt taking allowable stress for the bolt material as 80 MPa and using copper gasket. (06 Marks)

b A bracket is fixed to the wall by means of bolts and loaded as shown in Fig Q9(b). Determine the size of bolts taking allowable shear stress of bolt material as 40 MPa. (10 Marks)

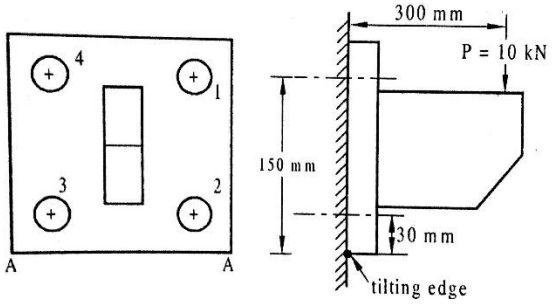

Fig Q9(b)

OR

10 **a** Explain self-locking in power screws. (04 Marks)

b A Power screw for a jack has square threads of proportion 50 mm x 8 mm. The coefficient of friction of the threads is 0.1 and the collar is 0.12. Determine the weight that can be lifted by this jack through an effort of 350 N at the end of a lever of length 400 mm. (12 Marks)

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Model Question Paper (CBCS) with effect from 2015-16

15ME552

USN | | | | | | | | | | |

Fifth Semester B.E. Degree (CBCS) Examination

Theory of Elasticity

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** A point under three dimensional stress system is on xyz coordinate system. Derive the Cauchy's stress equations for the component of the stresses on an arbitrary plane. (10 Marks)

b Explain stress invariants and plane state of stress. (06 Marks)

OR

2 **a** Derive expressions for Octahedral normal and Octahedral shear stresses in terms of stress invariants. (08 Marks)

b Rectangular component of stress at a point is given by $\sigma = \begin{bmatrix} 50 & 30 & 10 \\ 30 & 30 & 20 \\ 10 & 20 & 15 \end{bmatrix}$ MPa.

Determine the stresses on a plane whose outward normal (08 Marks)

a) Has direction cosines $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0$

b) Has direction ratio 3, 2, -1

MODULE – II

3 **a** Discuss the significance of compatibility conditions. (10 Marks)

Given the following strain field:

$\varepsilon_x = 5 + x^2 + y^2 + x^4 + y^4$

$\varepsilon_y = 6 + 3x^2 + 3y^2 + x^4 + y^4$

$\gamma_{xy} = 10 + 4x^3y + 4y^3x + 8xy$

$\varepsilon_z = 0,\ \gamma_{yz} = 0,\ \gamma_{xz} = 0$

Determine whether the above strain field is possible.

b Displacement field at a point on a body is given as follows (06 Marks)
$u = (x^2yz+z^2)$; $v = (xy^2z+y^2)$; $w = (xyz^2+x^2)$. Determine the strain components at (2, 1, 2) and express them in matrix form.

OR

4 **a** Derive the first and second set of compatibility equations. (10 Marks)

b Define strain invariants and plane state of strain. (06 Marks)

MODULE – III

5 **a** Derive the biharmonic equation considering the plane strain condition in the Cartesian coordinate system. (10 Marks)

b The state of stress at a point is given by:

$\sigma_x = 200\,\text{MPa},\ \sigma_y = -100\,\text{MPa},\ \sigma_z = 50\,\text{MPa}$

$\sigma_{xy} = 40\,\text{MPa},\ \sigma_{yz} = 50\,\text{MPa},\ \sigma_{zx} = 60\,\text{MPa}.$

If E = $2\text{x}10^5$ N/mm^2 and G = $0.8\text{x}10^5$ N/mm^2, find the corresponding strain components from Hooke's law. Take ν=0.2. (06 Marks)

OR

6 **a** Derive the expressions for stresses in a thick cylinder under the uniform internal and external pressures. (16 Marks)

MODULE – IV

7 **a** Derive the expressions for stresses σ_r and σ_θ in a solid rotating disc of uniform thickness. (09 Marks)

b A solid disc of 150 mm radius rotates at 500 rpm. Given: mass density = 7.2 x 10^{-6} kg/mm^3, E = $2\text{x}10^5$ MPa and ν=0.3. Find the value of circumferential stress at the center of the disc and at the outer periphery. Also, find the change in radius. (07 Marks)

OR

8 **a** A disc of uniform thickness with inner and outer diameter 100 mm and 400 mm, respectively, is rotating at 5000 rev/min. The density of the material is 7800 kg/m^3 and ν=0.28. Determine the radial and circumferential stress at a radius of 0.05m. (08 Marks)

b A thin walled box section having dimensions 2a x a x t is to be compared with a solid circular section of diameter as shown in Fig. Q8(b). Determine the thickness *t* so that the two sections have (08 Marks)

a) The same maximum shear stress for the same torque and

b) The same stiffness

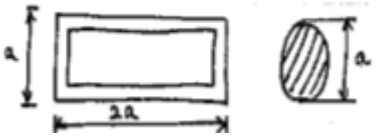

Fig. Q8(b)

MODULE – V

9 **a** Explain the significance of thermo-elastic stresses. Also, write the thermo-elastic stress strain relations. (06 Marks)

b Obtain the expressions for radial and tangential stresses in a solid circular cylinder subjected to uniform temperature. Also, obtain similar expressions for hollow cylinder. (10 Marks)

OR

10 **a** Derive Euler's expression for buckling load for column with both ends hinged. (08 Marks)

b Derive the expressions for stress components in a thin circular disc subjected to temperature. (08 Marks)

Model Question Paper (CBCS) with effect from 2015-16

15ME552

USN | | | | | | | | | | |

Fifth Semester B.E. Degree (CBCS) Examination

Theory of Elasticity

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** Derive the equations of equilibrium for a 2-D stress state. (08 Marks)

b State of stress at a point is given by $\sigma = \begin{bmatrix} 12 & 6 & 9 \\ 6 & 10 & 3 \\ 9 & 3 & 14 \end{bmatrix}$ MPa. Find principal stresses and directions. (08 Marks)

OR

2 **a** A point under three dimensional stress system is on xyz coordinate system. Derive the Cauchy's stress equations for the component of the stresses on an arbitrary plane. (08 Marks)

b A rectangular component of stress at a point are given as follows:
σ_x = 100 MPa, σ_y = 75 MPa , σ_z = 50 MPa
σ_{xy} = 70 MPa, σ_{yz} = 50 MPa, σ_{xz} = 30 MPa
a) Find stresses on octahedral plane
b) Stress on plane whose outward normal has direction cosines $\frac{1}{\sqrt{2}}$, 0, $\frac{1}{\sqrt{2}}$ (08 Marks)

MODULE – II

3 **a** Derive the first and second set of compatibility equations. (10 Marks)

b The displacement field is given by u = (x^2+2z) ; v = $(4x+2y^2+z)$; w = $(4z^2)$. What are the strain components at (2, 2, 3) and express them in matrix form. (06 Marks)

OR

4 **a** Discuss the significance of compatibility conditions. Also, define plane state of strain. (06 Marks)

b If strain at a point is given as follows: (10 Marks)
$\varepsilon_x = 4\text{x}10^{-3}$, $\varepsilon_y = 3\text{x}10^{-3}$, $\varepsilon_z = 2\text{x}10^{-3}$
$\gamma_{xy} = 2\text{x}10^{-3}$, $\gamma_{yz} = 1\text{x}10^{-3}$, $\gamma_{xz} = -3\text{x}10^{-3}$
Find the principal strains and determine the direction cosines of maximum principal strain.

MODULE – III

5 **a** Determine the bending stress component in case of bending of cantilever bean by an end load. (09 Marks)

b A thick cylinder of internal diameter 150 mm and external diameter 200 mm is simultaneously subjected to internal pressure of 10 MPa and external pressure of 4 MPa. Given, E = $2\text{x}10^5$MPa and ν = 0.25. Determine: (07 Marks)

a) Circumferential stresses at r_i and r_o.
b) Plot variation of radial and hoop stress across the thickness.
c) Change in internal and external radii.

OR

6 **a** Derive the equations of equilibrium in polar coordinates. (10 Marks)

b The state of stress at a point is given by:

$\sigma_x = 200\,\text{MPa},\ \sigma_y = -100\,\text{MPa},\ \sigma_z = 50\,\text{MPa}$

$\sigma_{xy} = 40\,\text{MPa},\ \sigma_{yz} = 50\,\text{MPa},\ \sigma_{zx} = 60\,\text{MPa}.$ (06 Marks)

If E = $2\text{x}10^5$ N/mm^2 and G = $0.8\text{x}10^5$ N/mm^2, find the corresponding strain components from Hooke's law. Take ν=0.2.

MODULE – IV

7 **a** Determine the maximum shear stress under torsion of a circular bar. (16 Marks)

OR

8 **a** Derive expressions for shearing stresses induced in a bar of elliptical cross section that is subjected to a twisting moment. Also, show that maximum stress occurs at the ends of the minor axis of ellipse. (08 Marks)

b A hollow disc of internal radius 100 mm and external radius 150 mm rotates at 200 rpm. Determine the circumferential stress at r_i and r_o. Also, find the change in internal and external radius. Assume: $\rho = 7.2 \times 10^{-6}$ kg/mm^3, E = 2×10^5 MPa and ν=0.3. (08 Marks)

MODULE – V

9 **a** Determine the radial and tangential stress distribution in a solid long cylinder subjected to a radial temperature distribution. (09 Marks)

b Derive Euler's expression for buckling load for column with one end fixed and other end free. (07 Marks)

OR

10 **a** Derive the expressions for stress components in a thin circular disc subjected to temperature. (10 Marks)

b Explain the significance of thermo-elastic stresses. Also, write the thermo-elastic stress strain relations. (06 Marks)

CBCS Scheme

15ME554

USN | | | | | | | | | |

Fifth semester B.E. Degree Examination, Model Question Paper - 1

Non Traditional Machining

Time: 3 hrs. **Max. Marks: 80**

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1. (a) Define and Classify Non –Traditional machining process. (6 Marks)
   (b) Explain the need of Non –Traditional machining process. (5 Marks)
   (c) List the advantages and disadvantages of Non –Traditional machining process. (5 Marks)

OR

2. (a) Enumerate the physical parameters of the Non –Traditional machining process. (6 Marks)
   (b) Discuss the process capability of any two Non –Traditional machining process. (5 Marks)
   (c) Differentiate Traditional and Non –Traditional machining process. (5 Marks)

Module-2

3. (a) Sketch and explain Ultrasonic machining process. (6 Marks)
   (b) Explain the influence of various process parameters on MRR in USM. (5 Marks)
   (c) Explain, how does abrasive jet machining differ from conventional sand blasting process? (5 Marks)

OR

4. (a) What are the different types of abrasives used in AJM? Explain any two. (6 Marks)
   (b) With neat sketch explain the working principle of Abrasive Jet machining process. (5 Marks)
   (c) With the help of neat sketch explain Water Jet Machining process. (5 Marks)

Module-3

5. (a) Explain different elements of electro chemical machining process. (6 Marks)
   (b) Sketch and explain the electro chemical grinding operation. (5 Marks)
   (c) With neat sketch, explain the working principle of ECM process. (5 Marks)

OR

6. (a) Sketch and explain different steps involved in the chemical machining process. (6 Marks)
   (b) Explain in brief the following in chemical machining process:
   i) Maskants, ii) Etchants. (5 Marks)
   (c) List the advantages, limitations and applications of chemical machining process. (5 Marks)

Module-4

7. (a) Sketch and explain the electrode feed control used in EDM process (6 Marks)
   (b) Explain with sketch the travelling wire EDM process. (5 Marks)
   (c) Sketch and explain various die electric flow patterns of EDM process. (5 Marks)

OR

8. (a) Explain with sketch the principle of working of plasma arc machining process. (8 Marks)
   (b) List the safety precautions, advantages, limitations and applications of PAM process. (8 Marks)

Module-5

9.	(a)	Sketch and explain Laser beam machining process.	(6 Marks)
	(b)	Discuss various process parameters of LBM process.	(5 Marks)
	(c)	List the advantages, limitations and applications of LBM process.	(5 Marks)

OR

10.	(a)	Explain with sketch the principle of working of Electron beam machining process.	(6 Marks)
	(b)	State the advantages and limitations of EBM process.	(5 Marks)
	(c)	Describe the apparatus used to generate the Laser.	(5 Marks)

CBCS Scheme

15ME554

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Fifth semester B.E. Degree Examination, Model Question Paper - 2

Non Traditional Machining

Time: 3 hrs. **Max. Marks: 80**

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1. (a) What are the basic factors upon which the Non –Traditional machining processes are classified. Explain. (8 Marks)
   (b) Make a comparison between Traditional and Non –Traditional machining process in terms of advantages, limitations and applications. (8 Marks)

OR

2. (a) Discuss the process economy of any four Non –Traditional machining process and compare with Conventional machining process. (8Marks)
   (b) Discuss how the Non –Traditional machining process are selected based on material used or material application. (8 Marks)

Module-2

3. (a) Explain with neat sketch various tool feed mechanisms used in Ultrasonic machining process. (8 Marks)
   (b) Sketch and explain, the working principle of Ultrasonic machining process and also mention its advantages. (8 Marks)

OR

4. (a) What are advantages, limitations and applications of AJM process? (6 Marks)
   (b) What are process variables that effect the performance of water jet machining process? (5 Marks)
   (c) With the help of neat sketch explain Water Jet Machining process. (5 Marks)

Module-3

5. (a) Sketch and explain electro chemical honing process. (8 Marks)
   (b) Discuss different process parameters of electro chemical machining process. (8 Marks)

OR

6. (a) Explain the different types of Maskants and Etchants used in chemical machining process. (6 Marks)
   (b) Explain chemical blanking process with the flow chart. (5 Marks)
   (c) List the advantages, limitations and applications of chemical machining process. (5 Marks)

Module-4

7. (a) Explain the functions and characteristics of dielectric fluid used in EDM process. (6 Marks)
   (b) Explain the mechanism of metal removal in EDM process. (5 Marks)
   (c) Sketch and explain four types of flushing methods used in EDM process. (5 Marks)

OR

8. (a) Explain non-thermal generation of plasma with suitable diagram. (8 Marks)
   (b) Explain process parameters and process characteristics of PAM process. (8 Marks)

Module-5

9.	(a) Sketch and explain mechanism of metal removal in Laser beam machining process.	(6 Marks)
	(b) Discuss various types of lasers used in LBM process.	(6 Marks)
	(c) Discuss the process characteristics of LBM.	(4 Marks)

OR

10.	(a) Sketch and explain the generation and control of electron beam used in EBM process.	(8 Marks)
	(b) List the advantages and limitations and applications of EBM process.	(8 Marks)

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15ME562

Model Question Paper (CBCS) with effect from 2015-16

Fifth Semester B.E. Degree (CBCS) Examination

Energy and Environment

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1	a	Interpret World Energy Scenario with respect to production and consumption using relevant statistics.	(10 Marks)
	b	Define Energy and Power. Differentiate the same.	(06 Marks)
		OR	
2	a	Explain the various key energy trends in India.	(08 Marks)
	b	Outline the factors that affect India's energy development.	(08 Marks)

MODULE – II

3	a	Explain in the detail the various phases of energy audit methodology.	(08 Marks)
	b	List the various thermal energy storage methods. Explain sensible heat and latent heat storage methods.	(08 Marks)
		OR	
4	a	Define Energy audit. Explain the need for energy audit.	(08 Marks)
	b	Write a short note on energy demand estimation.	(08 Marks)

MODULE – III

5	a	What is an ecosystem? Discuss forest ecosystem. Explain how conservation of forest can be done.	(08 Marks)
	b	Discuss how oxygen cycle is utilized in the ecosystem.	(08 Marks)
		OR	
6	a	Write a short note on (i) ecological succession (ii) food chain, food web and ecological pyramid.	(08 Marks)
	b	Elaborate how the nitrogen cycle ecosystem operates.	(08 Marks)

MODULE – IV

7	a	Discuss briefly the causes, effects and control measures of air pollution.	(10 Marks)
	b	Discuss Solid Waste Management techniques.	(06 Marks)
		OR	
8	a	Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution	(08 Marks)
	b	Enumerate the role of an individual in prevention of pollution.	(08 Marks)

MODULE – V

9	a	What is acid rain? What are its effects?	(06 Marks)
	b	Explain the salient features of Air Pollution act.	(10 Marks)
		OR	
10	a	Explain about Environment Impact Assessment (EIA).	(08 Marks)
	b	Discuss (i) Wildlife Protection act (ii) Forest Conservation act.	(08 Marks)

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15ME562

Model Question Paper (CBCS) with effect from 2015-16

Fifth Semester B.E. Degree (CBCS) Examination

Energy and Environment

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 a With relevant statistics, enumerate the primary energy production trend for India. (09 Marks)

b Explain the various key energy trends in India. (07 Marks)

OR

2 a Outline the factors that affect India's energy development. (10 Marks)

b Define Energy and Power. Differentiate the same. (06 Marks)

MODULE – II

3 a Calculate the cost of generation per kWh for a power station having the following data:
Installed capacity of the plant = 200 MW
Capital cost = Rs 400 crores
Rate of interest and depreciation = 12%
Annual cost of fuel, salaries and taxation = Rs 5 crores
Load factor = 50%
Also estimate the saving in cost per kWh if the annual load factor is raised to 60%. (08 Marks)

b Explain in the detail the various phases of energy audit methodology. (08 Marks)

OR

4 a Company owns a premium plot. They have to decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, they decide that the two best alternatives are as given in the following table: (08 Marks)

	Build Solar power plant	**Build Hydro power plant**
First cost (Rs.)	20,00,000	36,00,000
Annual property taxes (Rs.)	80,000	1,50,000
Annual income (Rs)	8.00,000	9,80,000
Life of land(years)	20	20

Evaluate the alternatives based on future worth method at i=12%

b Elaborate the benefits of thermal energy storage. (08 Marks)

MODULE – III

5 a Enumerate the utilization of carbon in ecosystem. (08 Marks)

b Describe grassland ecosystem. What are its types? How conservation of grassland can be made. (08 Marks)

OR

6 a Discuss how oxygen cycle is utilized in the ecosystem. (08 Marks)

b Define Environment. Mention its scope. Discuss the need for public awareness (08 Marks)

MODULE – IV

7	a	Enumerate the water pollution causes and its effects. Mention the control measures that can be initiated for mitigating the same.	(08 Marks)
	b	Discuss any two case studies related to pollution of environment in detail.	(08 Marks)

OR

8	a	Elaborate the causes, effects and control measures of (i) Soil Pollution (ii) Noise Pollution (iii) Thermal Pollution	(08 Marks)
	b	Discuss Solid Waste Management techniques.	(08 Marks)

MODULE – V

9	a	Write a note on ozone layer depletion.	(08 Marks)
	b	Express the need for reclaiming the wasteland and its development	(08 Marks)

OR

10	a	What are the regulations governing water pollution prevention act?	(08 Marks)
	b	Enumerate the impact of global warming on our mother nature.	(08 Marks)