DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD -402 103
Supplementary Winter Semester Examination – Nov - 2019

Branch: Mechanical Engineering **Sem.:- IV**

Subject :- Manufacturing Processes –I (BTMEC401) **Marks: 60**

Date:- 26/11/2019 **Time:- 3 Hr.**

Instructions to the Students

1. Attempt **any five** questions of the following.
2. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
3. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

Q. N.	Question	Marks
1 a	Sketch the cross section of a sand mould which is ready for pouring and label the various important parts. Give a brief write-up on the following casting terms - Sprue, Gate, Runner, Riser.	4 2
1b	Explain the following properties of a moulding sand. i) Adhesivness ii) Collapsibility iii) Permeability	6
2a	How does a cold rolling differ from hot rolling in terms of the process and product? Explain what do you understand by the terms slab and billet?	4 2
2b	Distinguish between open- and closed- die forging processes. What do you understand by the term flash in forging.	4 2
3a	A hole of 10 mm × 25 mm is to be cut in a 3 mm thick sheet. The shear strength of the material is 80 MPa. Estimate the press load required.	6
3b	Explain with sketches the difference between direct and indirect extrusion. List the variables which affect the extrusion process performance.	4 2
4a	List out any three differences between brazing and soldering. Write two applications of each of them. Explain the undercut and cracking defects in welding.	6
4b	Describe the submerged arc welding process in respect of working principle, advantages and limitations.	6
5a	List the methods of taper turning on a lathe. In a turning operation, a cutting speed of 55 m/min has been selected. At what rpm should a 15 mm diameter bar be rotated?	6
5b	Show with a neat sketch the various parts and angles of a twist drill. Explain the various allied operations that can be performed on drilling machine, draw a simple sketch.	6
6a	What are three basic forms of milling process? Differentiate between the up milling and down milling. Any three differences.	6
6b	Classify gear manufacturing methods. Explain gear hobbing process with a neat sketch.	6

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter End Semester Examination: Nov. - 2019

Branch: Mechanical Engg. (Second Year B.Tech.) **Sem.:- IV**
Subject with Subject Code:- Theory of Machines-I (BTMEC402) **Marks: 60**
Date:-28/11/2019 **Time:- 3 Hrs.**

Instructions:-

1. Figures to the right indicate full marks.
2. Clearly mention the main question number along with the sub questions.
3. Assume suitable data, if necessary.
4. All questions are compulsory.

Q.No.	Question	Marks
1	Solve any **Two:**	
	a) i) Describe Watt's straight line generating mechanism	2.5
	ii) Find degrees of freedom for the mechanism as shown in the Fig.1.	2.5

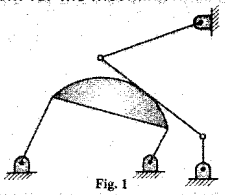

Fig. 1

	b) Explain the types of constrained motions with neat sketches.	05
	c) Explain with the help of neat sketches any two inversion of double slider crank chain.	05
2	a) For the configuration of slider crank mechanism shown in Fig.2, Calculate the, i. acceleration of the slider at B ii. acceleration of the point E iii. angular acceleration of the AB OA rotates at 20 rad/sec counter clockwise.	06

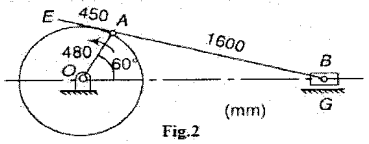

Fig.2

	b) In a horizontal IC engine mechanism, the crank of length 5 cm rotates at a uniform speed of 240 rpm. The length of connecting rod is 20 cm. when the crank has turned by 30° from its inner dead centre, locate all the instantaneous centers of the mechanism & find the angular velocity of the connecting rod & also the velocity of piston	04

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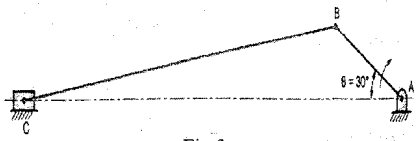

Fig.3.

3 Solve **Any Two**:

a) A load of 15 kN is raised by means of screw jack. The mean diameter of the square threaded screw is 42 mm & the pitch is 10 mm. A force of 120 N is applied at the end of a lever to raise the load. Determine the length of lever to be used & mechanical advantage obtained. Is the screw self-locking? Take $\mu = 0.12$. **05**

b) What are uniform pressure & uniform wear theories? Deduce expressions for the friction torque considering both the theories for a flat collar. **05**

c) Deduce an expression for the efficiency of an inclined plane when a body moves down a plane. **05**

4 Solve **Any Two**:

a) An automotive single plate clutch consists of two pairs of contacting surfaces. The outer diameter of the friction disk is 270 mm. The coefficient of friction is 0.3 and the maximum intensity of pressure is 0.3 N/mm^2. The clutch is transmitting a torque of 531 N-m. Assuming uniform wear theory, calculate: **05**

i. the inner diameter of the friction disk; and
ii. spring force required to keep the clutch engaged.

b) A brake drum of 440 mm in diameter is used in a braking system as shown in Fig.4. The brake lever is inclined at n angle of 20° with the horizontal. A vertical force of 400 N magnitude is applied at the lever end. The coefficient of friction is 0.35. The brake drum has a mass of 160 kg & it rotates at 1500 rpm. Determine the **05**

i. Braking torque
ii. Number of revolution made by the drum & the time taken before coming to rest from the instant of brake is applied

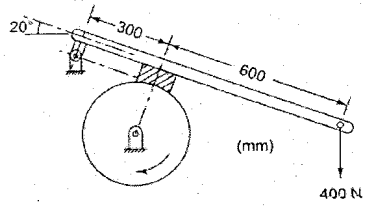

Fig.4.

c) Discuss Prony brake dynamometer & Rope brake dynamometer with neat sketches. **05**

5 a) Draw the profile of a cam operating a knife-edge follower having lift of 30 mm. The cam raises the follower with uniform acceleration & decelaration for 120° of the rotation followed by a period of dwell for 30°. The follower descends for the next 90° rotation of the cam with SHM, again followed by a dwell period. The cam rotates at a uniform speed of 800 rpm & has a least radius of 30 mm. What will be the maximum velocity & acceleration of the follower during the lift & the return? **08**

b) Write various types of cams. **02**

6 Solve **Any Two**:

a) Explain the direct & reverse crank method for determining unbalanced forces in radial engines. **05**

b) A three cylinder radial engine running at 1500 r.p.m. is having its axes at 120° to each other. The stroke is 120 mm & each connecting rod is 215 mm long. The mass of reciprocating parts is 3 kg per cylinder. Determine the primary & secondary unbalanced force acting on the engine. **05**

c) Explain the method of balancing of several masses rotating in same planes. **05**

*********Paper End*********

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,

LONERE – RAIGAD -402 103

Supplementary Winter Semester Examination: Nov. – 2019

Branch: Mechanical Engineering — Sem.:- IV

Subject: - Strength of Materials (BTMEC403) — Marks: 60

Date:- 30/11/2019 — Time:- 3 Hr.

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt any five questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Que.1 a) State and explain following terms — 6 Marks

i Hooke'law

ii Bulk Modulus

iii Poisson's ratio

b) A metallic bar 300 mm × 100 mm × 40 mm is subjected to external forces as shown in fig. 1. Determine change in volume of the block. Take $E = 2 \times 10^5$ N/mm2, $\mu = 0.25$. — 6 Marks

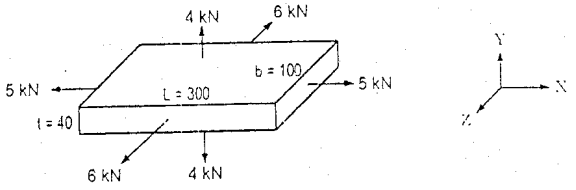

Figure.1

Que.2 a) A point in a strained material is subjected to stresses shown in fig. 2. Determine normal, tangential and resultant stresses across oblique plane by Mohr's circle method. Also calculate angle of obliquity. — 8 Marks

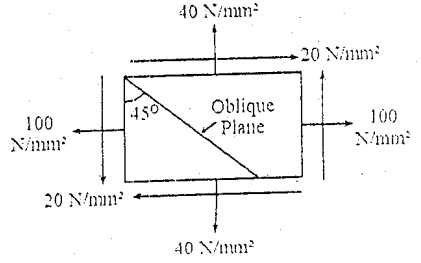

Figure.2

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b) A bar 1.5 m long and 10 mm diameter hangs vertically and has a collar securely fixed at the lower end. Find the maximum stress induced in the bar when a load of 150 N falls on the collar from a height of 25 mm. Take E = 2×10^5 N/mm². Also find strain energy stored in the bar. **4 Marks**

Que.3 a) A square column 300 mm × 300 mm carries an axial load of 200 kN. Find the position of 30 kN load along the axis bisecting the width of cross section so that end stresses developed at the other extreme of the column will be zero. **6 Marks**

b) A simply supported beam AB of span 4 m carries an uniformly distributed load as shown in fig. 3. Draw S.F. and B.M. diagrams for the beam. Find magnitude of maximum B.M. **6 Marks**

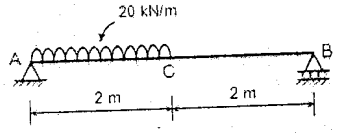

Figure.3

Que.4 a) A rectangular beam 300 mm wide and 200 mm deep is simply supported over a span of 8 m. What u.d.l. per meter the beam may carry, if the bending stress is not to exceed 120 N/mm² **4 Marks**

b) A channel section shown in fig. 5 (a) is used as a beam loaded as shown in fig. 5 (b). Draw the shear stress distribution diagram for the cross-section carrying maximum shear force. **8 Marks**

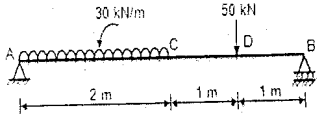

Fig. 5 (a)

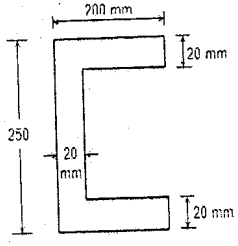

Fig. 5 (b)

Que.5 a) A simply supported beam carrying a point load is shown in fig.6. Determine **8 Marks**
:
1) Slope at A and B
2) Maximum deflection.
Take E = 200 GPa, I = 60×10^6 mm⁴.

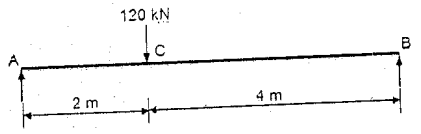

Figure.6

b) A simply supported beam 5 meter long, carries 10 kN of load at the mid-point. Calculate by moment area method, the slope at the supports and deflection at the mid-span. **4 Marks**
Take E = 2×10^5 N/mm² and I = 1×10^6 mm⁴.

Que.6. a) Two shaft AB and BC are connected in series as shown in fig. 7. The diameters of AB and BC are 100 mm and 50 mm respectively and their lengths are 200 mm and 300 mm respectively. Both the shafts are made of the same material having modulus of rigidity as 8×10^4 N/mm². Determine **6 Marks**
:
i) Shear stresses set up in each shaft, and
ii) The total angle of twist.
The torque applied at the one end is 10 kNm.

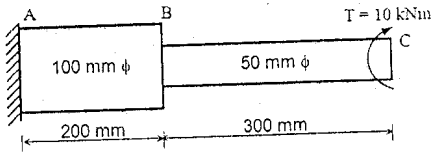

Figure.7

b) The external and internal diameter of a hollow C.I. column is 5 cm and 4 cm respectively. If the length of its column is 3 m and both of its ends are fixed. Determine the crippling load using Rankine's formula. **6 Marks**
Take σc = 550 N/mm² and α = 1/1600 in Rankine's formula.

PAPER END

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE - RAIGAD -402 103
Winter Semester Examination - Dec - 2019

Branch: Mechanical Engineering **Sem.:-** IV

Subject:- Numerical Methods in Mechanical Engineering (BTMEC404) **Marks: 60**

Date:- 02/12/2019 **Time:- 3 Hr.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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(Marks)

Q.1. **(a)** Explain the following; Approximate error, Precision and accuracy with suitable example? **(6)**

(b) (i) The length and breadth of a rectangle are A body travels uniformly a distance of (5.7±0.1) cm and (3.4±0.2) cm. Find the area of the rectangle with in error limit. **(4)**

(ii) Round off the following to four significant digits. **(2)**
0.0063945, 0.090038

Q.2. Find the positive root of the equation $xe^{-x} = 1$ using bisection method which lies between 0 and 1 till approximate error becomes 10%. Show lower limit, upper limit and approximate error in each iteration. **(12)**

Q.3. Use Gauss elimination to solve **(12)**

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

Q.4. **(a)** The work done on an object is equal to the force times the distance moved in the direction of the force. The velocity of an object in the direction of a force is given by

$v = 4t \qquad 0 \le t \le 6$

where v is in m/s. Employ the multiple application trapezoidal rule to determine the work if a constant force of 200 N is applied for all t. **(8)**

(b) Obtain the forward Difference expression for first derivatives. **(4)**

Q.5.

(a) Solve the following ODE using Euler's method from t = 0 to 3 taking step size of 1.

$\frac{dy}{dt} = -y + t$ given $y(0) = 1$ **(6)**

(b) The table below gives the temperature T (^{0}C) and length l (mm) of a heated rod. Find the values of length at 55^{0}C using quadric interpolation. **(6)**

T	40	50	60
l	600.5	600.6	600.8

Q.6. Draw the algorithm of the following Numerical Methods **(Any Two).** **(12)**
(i) NR Method
(ii) Simple Trapezoidal Rule
(iii) 1/3rd Simpson Rule

Paper End

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – Dec. - 2019

Branch: B.Tech **Sem.: IV**

Subject: - Interpersonal Communication Skills and Self Development for Engineers (BTHM3402) **Marks: 60**

Date: 04/12/2019 **Time:- 3 Hr**

(Attempt any five questions)

Q. 1. a) How will you prepare proper slides for an effective presentation? **6 Marks**

Q. 1. b) Critically evaluate the role of English language in professional life of an employee. **6 Marks**

Q. 2. According to you, how to get prepared for an interview? Explain. **12 Marks**

OR

Q. 2. a) What employability skills should be taken into consideration by a candidate in the process of interview? **6 Marks**

Q. 2. b) How will you advise your friend to develop positive attitude in him/her? **6 Marks**

Q. 3. How will you consider the role of SWOT analysis in personality development of an employee? Elaborate. **12 Marks**

Q. 4 Critically comment on the constituents of effective communication. **12 Marks**

OR

Q. 4. 'Speaking plays an instrumental role in the process of career enhancement', illustrate. **6 Marks**

Q. 4. b) Write short notes on i) self-evaluation, ii) self-discipline and iii) self-criticism. **6 Marks**

Q. 5. Explain how verbal and non-verbal means of communication can be used effectively in presentation? **12 Marks**

Q. 6. a) What is intrinsic motivation; explain with appropriate examples. **6 Marks**

b) What do you acknowledge through the following notion: '1% Passion + 99% Hard-work = Success'? **6 Marks**

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Supplementary Examination – December - 2019

Branch: B. Tech **Semester:IV**

Subject with Subject Code- Physics of Engineering Materials - (BTBSE406A) **Marks: 60**

Date - 04/12/2019 **Time - 3Hr.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

Que. 1 Attempt the following.

a) What is Schottkey defect ? For Schottkey defect prove that **8 Marks**

$$n = N \exp(-\frac{Es}{2kT})$$

b) Calculate the wavelength of X- ray beam incident at a glancing angle 12^0 for the first order reflection from a calcite crystal if the inter-atomic spacing d for the crystal is 3.035 Å. **4 Marks**

Que. 2 Attempt the following.

a) For Langevin's Diamagnetic theory, prove that **8 Marks**

$$\chi = -\frac{\mu_0 N e^2 R^2}{6m}$$

b) A magnetic field of 1800 A/m produces a magnetic flux density of 3 x 10^{-5} Wb in an iron bar of cross sectional area 0.2 cm^2. Calculate permeability. **4 Marks**

Que. 3 Attempt the following.

a) What is a Cooper pair? Explain BCS theory of superconductors. 8 Marks

OR

a) What is Josephson effect? Write a note on Cryotron — 8 Marks

b) Calculate the critical current which can flow through a long thin superconducting wire of aluminium of 10^{-3} m diameter. The critical magnetic field for aluminium is 7.9×10^3 A/m. — 4 Marks

Que. 4 Attempt the following.

a) What is Hall effect? Derive an expression for Hall coefficient and mobility of charge carriers. Discuss any two of its applications. — 8 Marks

OR

a) Derive an expression for conductivity in intrinsic and extrinsic semiconductor materials. Write a note on Light Emitting Diode (LED). — 8 Marks

b) Calculate the conductivity of pure silicon at room temperature when the concentration of the carriers is 1.6×10^{10} cm^{-3}. Given $\mu_e = 1500$ cm^2/V-sec and $\mu_h = 500$ cm^2/V-sec. — 4 Marks

Que. 5 Attempt the following.

a) What is dielectric constant? Derive an expression for Clausius-Mosotti equation — 6 Marks

b) Explain temperature and frequency dependence of dielectric polarization — 6 Marks

OR

Que. 5 Attempt the following.

a) Explain powder method of X-ray diffraction. — 6 Marks

b) What is a Carbon Nano Tube (CNT)? Write properties and applications of CNTs. — 6 Marks

**********Paper End **********

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Winter 2019

Course: B. Tech in **Sem: III**

Subject Name: Engineering Mathematics-III (BTBSC301) **Marks: 60**

Date: 10/12/2019 **Duration: 3 Hr.**

Instructionts to the Students:

1. *Solve **ANY FIVE** questions out of the following.*
2. *The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Attempt the following.**		12
A)	Find $L\{cosht \int_0^t e^u \, coshu \, du\}$.	**Analysis**	4
B)	If $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$ is a periodic function with period 2π. Find $L\{f(t)\}$.	**Analysis**	4
C)	Using Laplace transform evaluate $\int_0^\infty e^{-at} \frac{sin^2 t}{t} \, dt$	**Evaluation**	4
Q. 2	**Attempt any three of the following.**		12
A)	Using convolution theorem find $L^{-1}\left\{\frac{1}{s(s+1)(s+2)}\right\}$	**Application**	4
B)	Find $L^{-1}\{\bar{f}(s)\}$, where $\bar{f}(s) = \log\left(\frac{s^2+1}{s(s+1)}\right)$	**Analysis**	4
C)	Using Laplace transform solve $y'' + 2y' + 5y = e^{-t} \sin t$; $y(0) = 0$, $y'(0) = 1$	**Application**	4
D)	Find $L^{-1}\left\{\frac{s^2+2s-4}{(s-5)(s^2+9)}\right\}$	**Analysis**	4
Q. 3	**Attempt any three of the following.**		12

A)	Express the function $f(x) = \begin{cases} \sin x, & 0 \le x \le \pi \\ 0, & x > \pi \end{cases}$ as a Fourier sine integral and hence evaluate that $\int_0^\infty \frac{\sin\lambda x \sin\lambda\pi}{1-\lambda^2}\, d\lambda$.	**Evaluation**	**4**
B)	Using Parseval's identity for cosine transform, evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$.	**Application**	**4**
C)	Find the Fourier sine transform of $f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2-x, & 1 \le x \le 2. \\ 0, & x > 2 \end{cases}$	**Analysis**	**4**
D)	If $F_s\{f(x)\} = \frac{e^{-as}}{s}$, then find $f(x)$. Hence obtain the inverse Fourier sine transform of $\frac{1}{s}$.	**Analysis**	**4**
Q. 4	**Attempt any three of the following.**		**12**
A)	Form the partial differential equation by eliminating arbitrary function f from $f(x^2+y^2+z^2, 3x+5y+7z) = 0$	**Synthesis**	**4**
B)	Solve $pz - qz = z^2 + (x+y)^2$	**Application**	**4**
C)	Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0,t) = 0$, $u(l,t) = 0$ $(t > 0)$ and the initial condition $u(x,0) = x$; l being the length of the bar.	**Analysis**	**4**
D	Use the method of separation of variables to solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, given that $u(x,0) = 6e^{-3x}$	**Application**	**4**
Q. 5	**Attempt the following.**		**12**
A)	Determine the analytic function $f(z)$ in terms of z whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$	**Analysis**	**4**
B)	Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find a function v such that $f(z) = u + iv$ is analytic.	**Analysis**	**4**
C)	Find the bilinear transformation which maps the points $z = 0, -1, -i$ onto the points $w = i, 0, \infty$. Also, find the image of the unit circle $\|z\| = 1$.	**Analysis**	**4**
Q. 6	**Attempt the following.**		**12**

A)	Use Cauchy's integral formula to evaluate $\oint_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)}\, dz$, where C is the circle $\|z\| = 3$.	**Evaluation**	**4**
B)	Find the poles of function $\frac{z^2-2z}{(z+1)^2(z^2+4)}$. Also find the residue at each pole.	**Analysis**	**4**
C)	Evaluate $\oint_C \frac{e^z}{\cos\pi z}\, dz$, where C is the unit circle $\|z\| = 1$.	**Evaluation**	**4**
	***** Paper End *****		

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination –- Dec. 2019

Branch: B Tech Mechanical Engineering **Sem.:- III**

Subject:- Material Science and Metallurgy (BTMEC302) **Marks: 60**

Date:- 12/12/2019 **Time:- 3 Hr.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

		(Marks)
Q.1.		**(12)**
a)	**Explain in short different imperfections in crystal structures**	**6**
b)	**Draw stress strain diagram for mild steel, show effect of Carbon content on shape of stress strain diagram**	**6**
Q2.		**(12)**
a)	**What is solid solution? Differentiate between substitutional and interstitial solid solution?**	**6**
b)	**Draw Fe-Fe_3C equilibrium diagram. Show all temperatures and phases**	**6**
Q3.		**(12)**
a)	**Draw neat labeled TTT diagram for eutectoid steel and give stepwise experimental procedure for drawing it.**	**6**
b)	**What is annealing? List different types of annealing along with their purpose.**	**6**
Q4.		**(12)**
a)	**Explain with neat sketches different types of flame hardening.**	**6**
b)	**What is surface hardening? Explain induction hardening with neat sketch.**	**6**
Q5.		**(12)**
a)	**Explain steps in specimen preparation for microscopy.**	**6**
b)	**For spark test draw the sparks for the following specimen**	**6**
	1. CI 2. MS 3. HSS	
Q6.		**(12)**
a)	**Write a note on strain hardening**	**6**
b)	**Explain dye penetrant test. What is its application?**	**6**

Paper End

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter SemesterExamination – December - 2019

Branch: Mechanical Engineering **Sem.:-III**

Subject with Subject Code:-Fluid Mechanics - BTMEC303 **Marks:60**

Date:-14/12/2019 **Time:- 3 Hr.**

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Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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(Marks)

Q.1. (a) Define the following fluid properties: (06)

(i)Viscosity

(ii)Compressibility

(iii)Surface Tension

(b)A U-tube manometer is used to measure the pressure of water in a pipe line,which is excess of atmospheric pressure. The right limb of the manometer contains mercury and open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of the water in the main line. If the difference in the level of mercury in the limbs of U-tube is 10cm and the free surface of mercury is in the level with the center of the pipe. If the pressure of water in the pipe line reduced to 9810N/m^2 Calculate the new difference in the level of mercury. Sketch the arrangement in both cases. (06)

Q.2.(a) Prove that the Center of Pressure of a completely sub-merged plane surface is always below the Center of Gravity of the sub-merged surface when the plane surface is vertical. (06)

(b)What are the conditions of equilibrium of floating body and sub-merged body? (06)

Q.3.(a)Define the following flow: (06)

(i)Steady Flow
(ii)Non-Uniform Flow
(iii)Laminar Flow
(iv)Turbulant Flow
(v)Compressible Flow
(vi)Irrotatinal Flow

(b)Derive an expression of three dimensional continuity equation in rectangular cooridinate system. (06)

OR

(b)If for a two-dimensional potential flow, the velocity potential is given by $\Phi = x(2y - 1)$ Determine the velocity at the point P(4,5) and value of stream function at the point P. (06)

Q.4.(a)Derive an expression for the Discharge throughTriangular Notch. (06)

(b)A 30cm×15cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 30cm. The

differential U-tube mercury manometer shows a difference of mercury level 25cm.

Calclate:

(i)The discharge of oil

(ii)The pressure difference between entrance section and throat section.

Take Cd=0.98 and specific gravity of mercury =13.6 (06)

Q.5.(a)Derive an expression for shear stress distribution and velocity distribution for Laminar flow though circular pipe. (06)

(b)A horizontal pipe line 40m long is connected to a water tank at one end and discharges freely into atmosphere at other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm.The height of water level in the tank is 8m above the center of the pipe. Considering all losses of head which occur. Determine the rate of flow.Take f=0.01for both pipe. (06)

Q.6.(a)The efficiency η of fan depends on density ρ, dynamic viscosity μ of the fluid, angular velocity ω , diameter D of the rotor and the discharge Q. Express efficiency η of fan in terms of dimensionless parameters. (06)

(b) Define Displacement thickness. Derive an expression for displacement thickness. (06)

OR

(b)What do you understand by: Total drag on the body,Resulant force on a body, co-efficient of drag and co-efficient of lift. (06)

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – December - 2019

Branch: **B. Tech Mechanical** Sem.:- **III**

Subject with Code:- **Machine Drawing and CAD (BTMEC304)** Marks: **60**

Date:- **17/12/2019** Time:- **3 Hr.**

Instructions to the Students

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately Assume it and should mention it clearly

(Marks)

Q.1. Illustrate **any three** with an example **(3×4=12)**

a) Half section
b) Removed section
c) Broken section
d) Auxiliary section

Q.2. Attempt **any two** of the following **(12)**

a) Draw the symbol of the following **(6)**
   1. concave fillet weld
   2. convex double V-butt weld

b) Draw conventional representation for the following **(6)**
   1. Spur gears in mesh
   2. Roller bearing

c) Draw neat sketch in two views of a flanged coupling. **(6)**

Q.3. Attempt **any two** of the following **(12)**

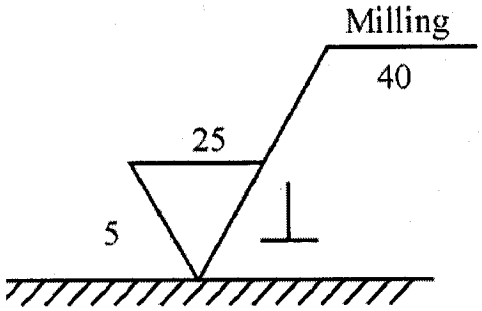
a) A vertical cylinder of 75 mm diameter is penetrated by another cylinder of 50 mm diameter. The axis of which is parallel to both HP & VP. The two axes are 9 mm apart. Draw the projection of two cylinders showing curves of intersection. The length of both cylinders is 100 mm. **(6)**

b) A vertical square prism of side of base 40 mm axis height 75 mm has its faces equally inclined with V.P. A cylinder of diameter 40 mm and length 75 mm intersects the prism horizontally such that its axis is perpendicular bisector to the axis of vertical square prism. The plane containing both the axis is parallel to V.P. Draw the projections of solids showing curve of intersection. **(6)**

c) A cone with base diameter 70 mm & axis height 65 mm is kept on HP on its base. It is penetrated by a horizontal cylinder of diameter 35 mm with its axis parallel to VP & intersecting axis of cone at distance of 20 mm above base of cone. Draw projection of solid and curve of intersection. (6)

Q.4. Attempt any two of the following (12)

a) State the meaning of following symbol as shown in Fig. (6)



b) State the advantages of Computer Aided Design and Drafting. (6)

c) A shaft and hole are given as (6)

$$\text{Shaft } 50^{+0.280}_{+0.120} \qquad \text{Hole} 50^{+0.090}_{+0.000}$$

Determine:

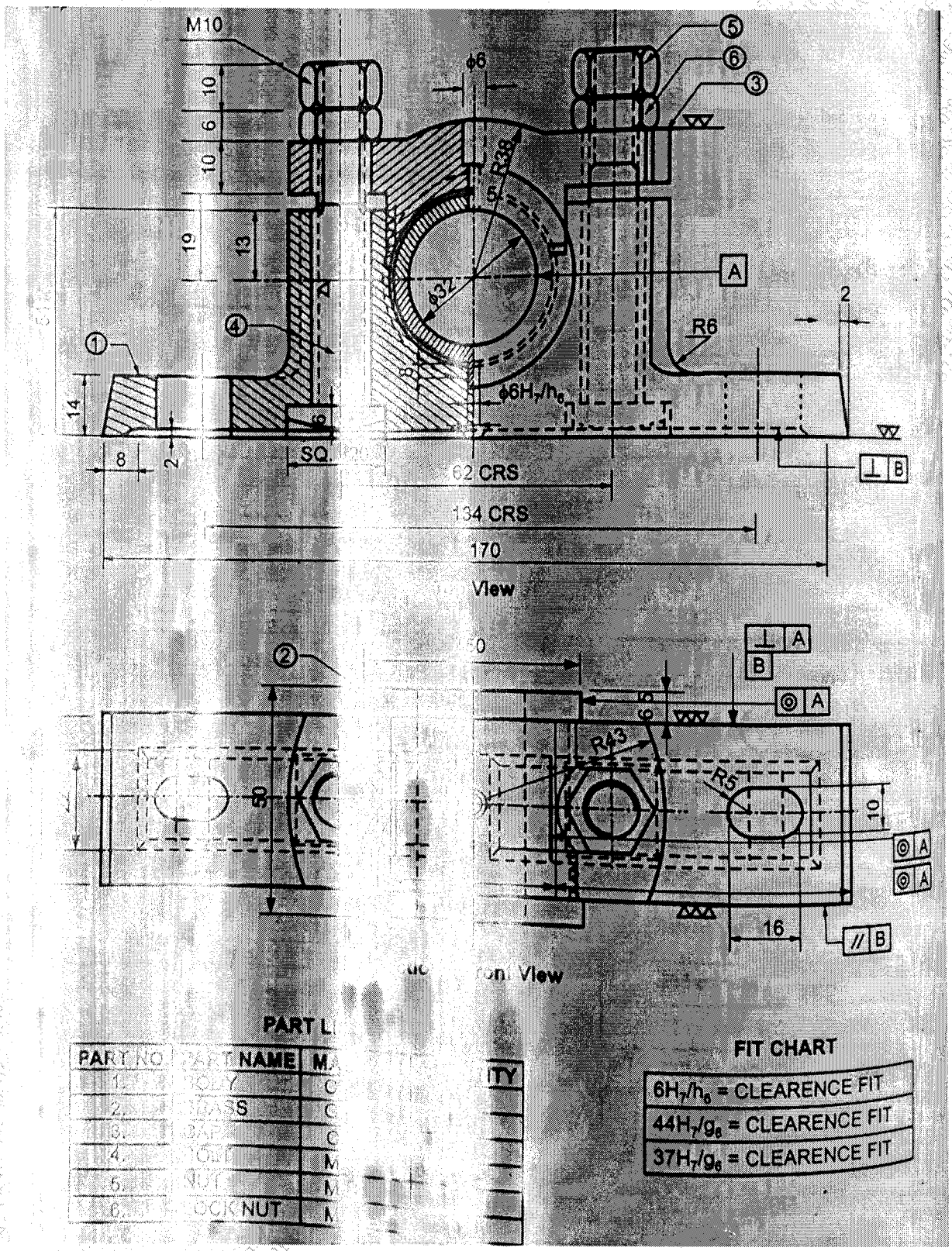
(i) Maximum allowance (ii) Minimum allowance (iii) Type of fit

Q.5. Fig. shows assembly of Pedestal Bearing. Draw detailed drawing of the following.

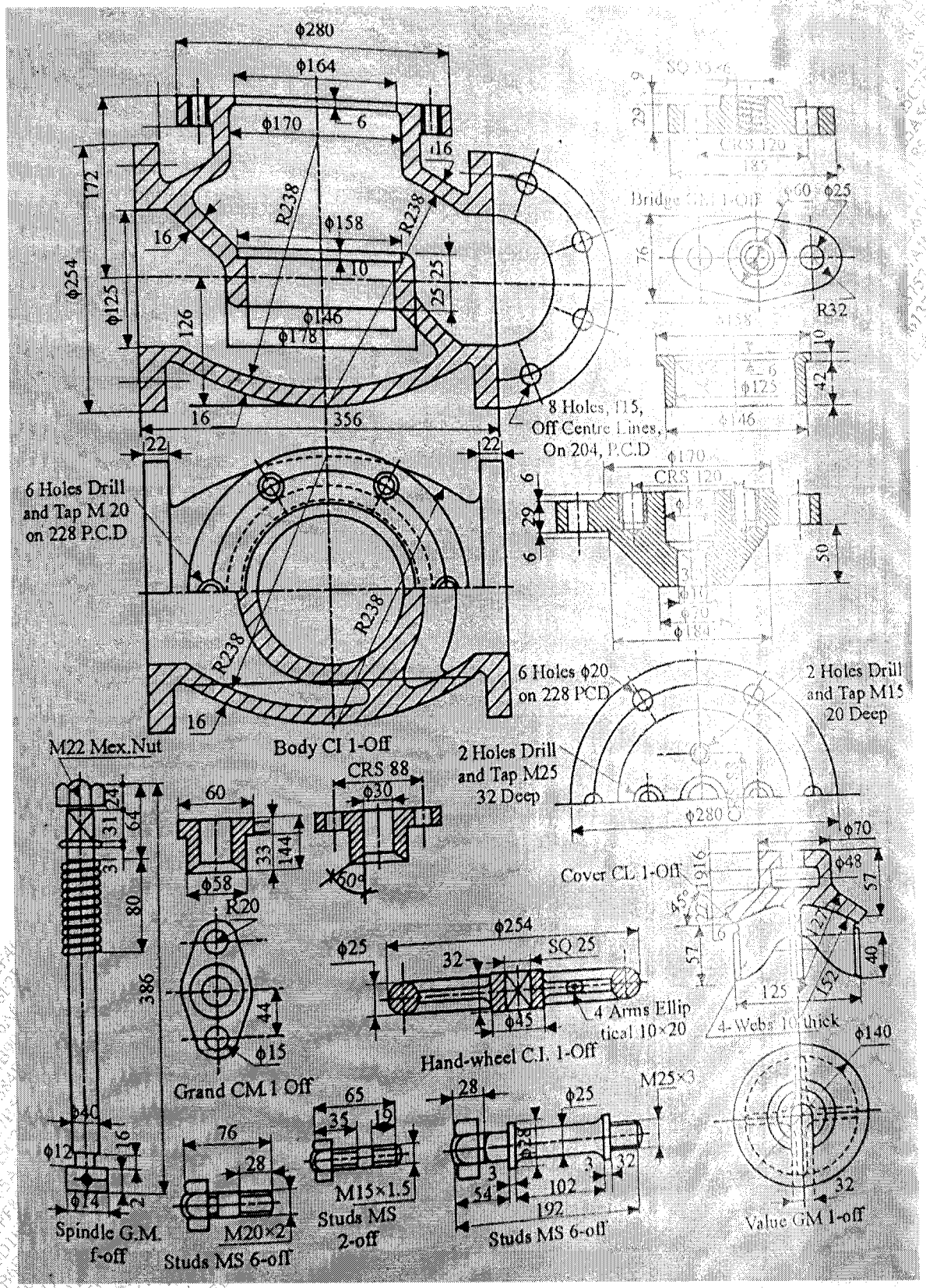
a) Body (4)

b) Brass (4)

c) Cap (4)



Q.6. Figure shows the details of 125 mm Steam Valve. Draw the assembled full sectional elevation. (12)



****paper end**

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE - RAIGAD - 402 103
Winter Semester Examination - Dec. - 2019

Branch: B. Tech in Mechanical Engineering | Sem.:- III
Subject: Thermodynamics (BTMEC305) | Marks: 60
Date: 19/12/2019 | Time: - 3 Hr.

Instructions to the Students

1. Each question carries 20 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.
5. Use of steam tables is allowed.

Q.1. Attempt the following:

(A) Separate the list P (pressure), V (volume), v (specific volume), ρ (density), m (mass), and t (temperature) into intensive properties, and extensive properties. **(03)**

(B) What is the zeroth law of thermodynamics? Consider two closed systems A and B. System A contains 3000 kJ of thermal energy at 20°C, whereas system B contains 200 kJ of thermal energy at 50°C. Now the systems are brought into contact with each other. Whether the direction of heat transfer between the two systems will be from system A to system B or from system B to system A? Why? **(03)**

(C) Determine the total work done by a gas system following an expansion process A-B-C as shown in Figure 1 (C). **(02)**

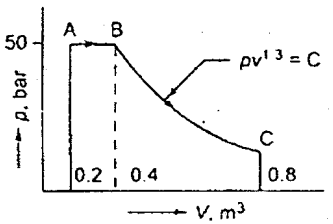


Fig. 1(c). Question 1 (c)

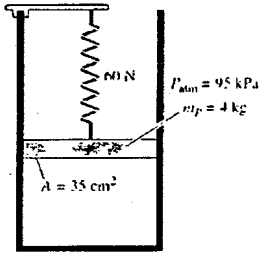


Fig. 1(D), Question 1(D)

115°C. Calculate the dryness fraction of the steam in the main. **(03)**

(C) 0.1 m³ of an ideal gas at 300 K and 1 bar is compressed adiabatically to 8 bar. It is then cooled at constant volume and further expanded isothermally so as to reach the condition from where it started. Calculate:

(i) Pressure at the end of constant volume cooling. **(01)**

(ii) Change in internal energy during constant volume process in kJ. **(02)**

(iii) Net work done and heat transferred during the cycle. **(04)**
Assume C_p = 14.3 kJ/kg K and C_v = 10.2 kJ/kg K.

**********Paper End**********

Q.3. Attempt the following

(A) What is cyclic heat engine? Define thermal efficiency of a heat engine. Can it be 100? Why? **(03)**

(B) What is the difference between a heat pump and a refrigerator? Show that COP of a heat pump is greater than COP of a refrigerator by unity. **(04)**

(C) What is PMM-1 and PMM-2? **(01)**

(D) Using an engine of 30% thermal efficiency to drive a refrigerator having a COP of 5, what is the heat input into the engine for each MJ removed from the cold body by the refrigerator? If this system is used as a heat pump, how many MJ of heat would be available for heating for each MJ of heat input to the engine? **(04)**

Q.4. Attempt the following:

(A) What are the four processes that make up the Carnot cycle? Show the Carnot cycle on P-v and T-s diagrams. What is reversed Carnot cycle? What do you understand by Irreversibility and 'inequality of Clausius'? **(02)**

(B) During the isothermal heat addition process of a Carnot cycle, 900 kJ of heat is added to the working fluid from a source at 400°C. Determine (*a*) the entropy change of the working fluid, (*b*) the entropy change of the source, and (*c*) the total entropy change for the process. **(05)**

Q.5. Attempt the following:

(A) Explain the following terms giving suitable example. **(06)**
(i) Available energy and unavailable energy
(ii) High grade energy and low grade energy
(iii) Dead state

(B) Calculate the decrease in available energy when 25 kg of water, at 95°C mixes with 35 kg of water at 35°C, the pressure being taken as constant and the temperature of the surroundings being 15°C . (Cp of water = 4.2 kJ/kg K). **(06)**

Q.6. Attempt the following:

(A) Steam enters an engine at a pressure 10 bar absolute and 400°C. It is exhausted at 0.2 bar. The steam at exhaust is 0.9 dry. Find : **(02)**
(i) change in enthalpy ;
(ii) Change in entropy.

(B) A throttling calorimeter is used to measure the dryness fraction of the steam in the steam main which has steam flowing at a pressure of 8 bar. The steam after passing through the calorimeter is at 1 bar pressure and

(D) A gas is contained in a vertical, frictionless piston-cylinder device (Fi1. 1(D)). The piston has a mass of 4 kg and a cross-sectional area of 35 cm^2. A compressed spring above the piston exerts a force of 60 N on the piston. If the atmospheric pressure is 95 kPa, determine the pressure inside the cylinder in kPa. **(02)**

(E) Explain the following terms: **(02)**
(i) change of state,
(ii) path,
(iii) process
(iv) Thermodynamic cycle.

Q.2. Attempt the following:

(A) A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During a cycle, the sum of all heat transfers is -170 kJ. The system completes 100 cycles per min. Complete the following table showing the method for each item, and compute the net rate of work output in kW. **(03)**

Process	Q (kJ/min)	W (kJ/min)	ΔE(kJ/min)
a-b	0	2170	---
b-c	21000	0	---
c-d	-2100	---	-36600
d-a	---	---	---

(B) A nozzle is a device for increasing the velocity of a steadily flowing stream. At the inlet to a certain nozzle, the enthalpy of the fluid passing is 3000 kJ/kg and the velocity is 60 m/s. At the discharge end, the enthalpy is 2762 kJ/kg. The nozzle is horizontal and there is negligible heat loss from it.
(a) Find the velocity at exists from the nozzle in m/s. **(02)**
(b) If the inlet area is 0.1 m^2 and the specific volume at inlet is 0.187 m^3/kg, find the mass flow rate in kg/s. **(01)**
(c) If the specific volume at the nozzle exit is 0.498 m^3/kg, find the exit area of the nozzle. **(02)**

(C) What is the difference between 'work transfer' and 'heat transfer'? What is 'point function' and 'path function'? **(04)**