

4E 4140

Roll No. \_\_\_\_\_

[Total No. of Pages : 4]

4E 4140

**B.Tech. IV Semester (Main/Back) Examination, June/July - 2015****Mechanical Engineering****4ME1A Kinematics of Machines****Common for AE&ME****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****Instructions to Candidates:**

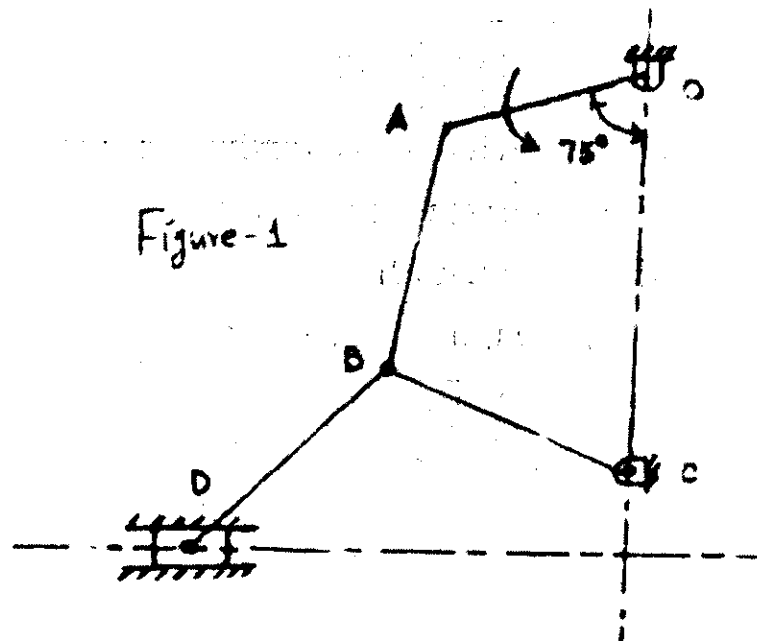
*Attempt any **five** questions, selecting **one** question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

**Unit - I**

1. (a) What do you mean by inversion of a mechanism ? Explain with the help of neat sketches, all the inversions of double slider crank chain. (8)
- (b) Explain with the help of neat sketches, various types of Kinematic pairs giving example for each one of them. (8)

**OR**

2. (a) Draw and explain Klien's construction for determining the velocity and acceleration of the piston in a slider crank mechanism. (8)
- (b) In Figure-1, the angular velocity of the crank OA is 600 r.p.m. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of  $75^\circ$  to the vertical. The dimensions of various links are: OA=28 mm, AB=44 mm, BC=49 mm and BD=46 mm. The centre distance between the centres of rotation 'O' and 'C' is 65 mm. the path of travel of the slider is 11 mm below the fixed point C. The slider moves along a horizontal path and OC is vertical. (8)



### Unit - II

3. (a) Derive an expression for the ratio of shaft velocities for Hooke's joint and draw the polar diagram depicting the salient features of driven shaft speed. (8)
- (b) Explain with neat sketch the working of overhead valve mechanism of an I.C. Engine. (8)

OR

4. (a) What is the condition for correct steering? Derive the relation  $\tan \alpha = \frac{c}{2b}$  for Davis steering gear mechanism. (8)
- (b) With a neat sketch, explain the working principle of Scott-Russel mechanism. (8)

### Unit - III

5. a) State the laws of dry friction. (4)
- b) Define the following terms.
  - (i) Coefficient of friction.
  - (ii) Limiting friction.
  - (iii) Angle of friction.
  - (iv) Angle of repose. (4)
- c) The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5mm. The coefficient of friction between the screw and nut is 0.13. Determine the torque required on the screw to raise a load of 25kN, assuming the load to rotate with the screw. Determine the ratio of the torque required to (2)

raise the load to the torque required to lower the load and also the efficiency of the machine. (8)

OR

6. a) A leather belt is required to transmit 7.5 kw from a pulley 1.2m in diameter, running at 250 r.p.m. The angle embraced is  $165^\circ$  and the coefficient of friction between the belt and the pulley is 0.3. If the safe working stress for the leather belt is 1.5 Mpa, density of leather  $1\text{Mg/m}^3$  and the thickness of belt 10 mm. Determine the width of the belt taking centrifugal tension into account. (8)
- (b) Derive the condition for transmitting maximum power in a flat belt drive. (8)

Unit - IV

7. (a) The thrust of a propeller shaft in a marine engine is taken up by a number of collars integral with the shaft which is 300 mm in diameter. The thrust on the shaft is 200 KN and the speed is 75 r.p.m. Taking coefficient of friction equal to 0.05 and assuming intensity of pressure as uniform and equal to 0.3 Mpa, find the external diameter of the collar and the number of collars required, if the power lost in friction is not to exceed 16 kw. (8)
- (b) Describe with a neat sketch the working of a single place friction clutch. (8)

OR

8. a) Show that in a band and block brake, the ratio of the maximum and minimum tension in the brake straps is  $\frac{T_0}{T_n} = \left[ \frac{1 + \mu \tan \theta}{1 - \mu \tan \theta} \right]^n$

where  $T_0$  = maximum tension,  $T_n$  = minimum tension,  $2\theta$  = angle subtended by each block at the centre of the drum. (8)

- b) A band brake acts on the  $\frac{3}{4}$  of circumference of a drum of 450 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 225 N-m. One end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 500 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the anticlockwise direction. (8)

Unit - V

9. (a) Define the following terms as applied to cam with a neat sketch.
- (i) Base circle
  - (ii) Pitch circle
  - (iii) Pressure angle

- (iv) pitch point (4)
- (b) Explain with sketches the different types of cams and followers. (4)
- (c) Draw the displacement, velocity and acceleration diagram for a follower moving with simple harmonic motion. Derive the expression for velocity and acceleration during outstroke and return stroke of the follower. (8)

**OR**

10. A cam is to be designed for a knife edge follower with the following data :

- (i) Cam lift = 40 mm during  $90^\circ$  of cam rotation with simple harmonic motion.
- (ii) Dwell for the heat  $30^\circ$ .
- (iii) During the next  $60^\circ$  of cam rotation, the follower returns to its original position with simple harmonic motion.
- (iv) Dwell during the remaining  $180^\circ$ . Draw the profile of the cam when the line of stroke of the follower passes through the axis of cam shaft. Radius of the base circle is 40 mm. Determine the velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m. (16)

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	<b>B.Tech. IV Semester (Old/Back) Examination, June/July - 2015</b>	
	<b>Mechanical Engineering</b> <b>4ME2A Fluid Mechanics</b> <b>Common with AE</b>	

Time : 3 Hours

Maximum Marks : 80  
Min. Passing Marks : 24

**Instructions to Candidates:**

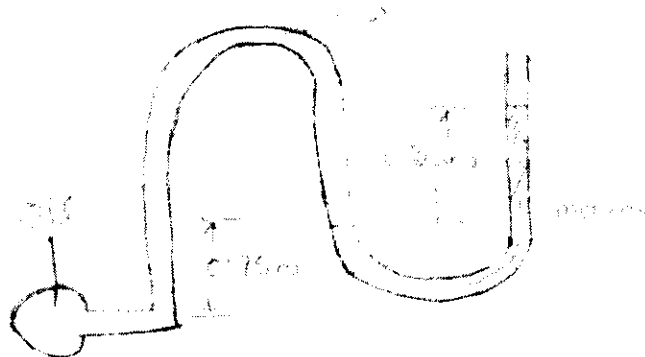
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**Unit - I**

1. a) A Circular disc of diameter  $D$  is immersed vertically in a Liquid of density  $\rho$ . The top most point of the disc just touches the liquid surface. Derive an expression for the depth of centre of pressure. (8)
- b) A solid cylinder of diameter 30cm and height 15cm is to float in water with its axis vertical in sea water ( $S=1.03$ ). The relative density of the cylinder material is 0.9. Find the meta centric height of cylinder. (8)

**OR**

1. a) Derive an expression for Meta-centric height of floating body. (10)
- b) Figure shows a manometer connected to a pipeline containing oil of specific gravity 0.8. Find the pressure of oil. (6)



**Unit - II**

2. a) Derive an expression for the discharge over V-notch. (8)
- b) A horizontal boiler of 4m in diameter and 12 m long contains water upto 2.5m. Find the time taken to empty the tank through an orifice of 16 cm diameter located at the bottom of the boiler. Take  $C_d=0.75$  (8)

**OR**

2. a) The Velocity components in a steady two dimensional flow are given as  $u = 5x^2$  and  $v = -15x^2$  obtain an equation of a stream line. (8)
- b) Derive an expression of discharge through venturimeter. (8)

**Unit - III**

3. a) An oil  $\rho=920 \text{ kg/m}^3$ ,  $\mu=0.08$  poise) is flowing through a pipe of 8cm. The head loss was 2m in the distance of 20m along the flow. Determine  
 (i) The mean Velocity  
 (ii) Discharge. (8)
- b) A pipeline of 2m diameter is to be designed to carry the oil at the rate  $5 \text{ m}^3/\text{s}$  having sp.gr =0.92 and  $\mu=0.04$  poise. Test were conducted using a pipe of 20 cm diameter and water as a liquid. Find the velocity and rate of flow required for the model pipe. Take  $\mu$  (water = 0.01 poise) (8)

**OR**

3. Using Buckingham  $\pi$ -theorem, prove that the thrust  $F$  in a screw propeller is given

$$\text{by } F = \rho v^2 d^2 f\left(\frac{v}{dN}, \frac{T}{\rho v^2 d^3}\right)$$

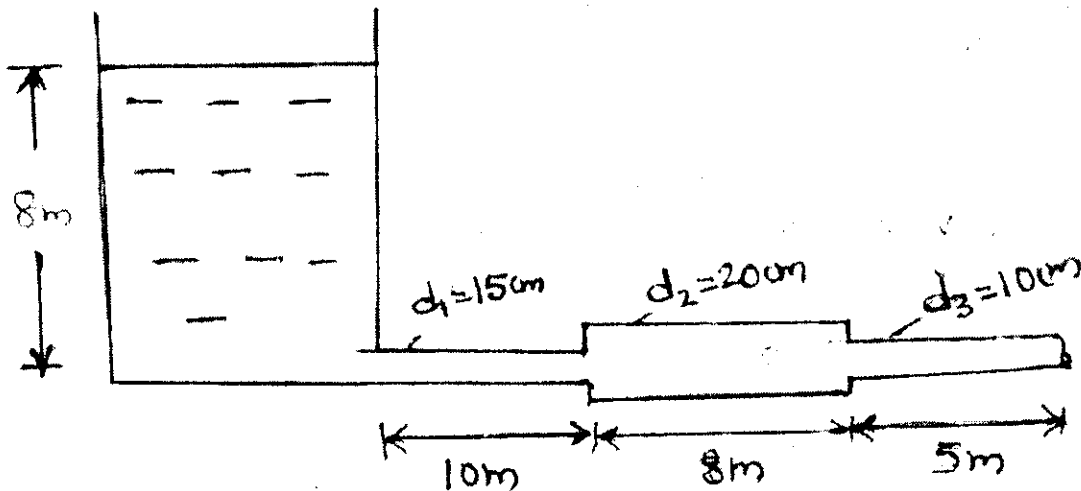
Where  $d$ ,  $v$ ,  $N$ ,  $T$  and  $\rho$  are diameter, velocity, speed, torque and density of the fluid respectively. (16)

**Unit - IV**

4. a) Two water tanks are connected by a pipe line of 20cm diameter and 300m long. The flow rate is  $0.4 \text{ m}^3/\text{s}$ . Find the difference in head between the two tanks. Take  $f=0.008$  for the pipe. (8)
- b) Determine the maximum power available at the exit of the pipe of 30 cm diameter and 3500 m long. The head at the inlet is 500m. Take  $f=0.006$  (8)

OR

4. Determine the discharge through pipe consider all losses and take  $f_1 = f_2 = f_3 = 0.001$



## Unit - V

5. (a) A flat plate of  $2\text{m} \times 1.5\text{m}$  is fixed horizontally in a wind tunnel where the wind speed is maintained at  $60\text{km/h}$ . Taking  $\rho$  (air-density)  $= 1.15\text{ kg/m}^3$ ,  $C_D = 0.20$  and  $C_L = 0.8$ , find out
- Lift force
  - Drag force
  - Power required to hold the plate stationary (8)
- b) Define displacement thickness. Derive an expression for the displacement thickness. (8)

OR

5. (a) Given that the velocity distribution in a laminae boundary layer due to flow over a flat plate is  $\frac{u}{U} = (\frac{3}{2}\eta - \frac{1}{2}\eta^3)$  where  $\eta = \frac{y}{\delta}$ , Calculate the displacement and momentum thickness in terms of the nominal boundary layer thickness  $\delta$ . (8)
- b) A man descends down with the help of hemispherical parachute of  $3\text{m}$  diameter with an uniform velocity  $20\text{ m/s}$  from a flying aeroplane. The weight of the parachute is  $10\text{N}$ . Taking  $C_D = 0.62$  and  $\rho = 1.2\text{ Kg/m}^3$  for air, find the weight of the man descending down. (8)





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	4E4142	
	B.Tech. IVsemester (Main/Back) Examination, June/July - 2015	
	Mechanical Engg.	
4ME3A: Machining & Machine Tools		

Time : 3 Hours

Maximum Marks : 80  
Min. Passing Marks : 26

**Instructions to Candidates:**

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

*Units of quantities used/calculated must be stated clearly.*

**Unit - I**

1. a) Explain the concept of generatrix and directrix. (8)
- b) Explain tool geometry of milling cutter and drills. (8)

**OR**

1. a) Explain geometry of single point cutting tool with significance of tool angles. (8)  
Explain various tool nomenclatures and their interrelationship.
- b) Explain mechanics of metal cutting and discuss various theories of metal cutting. (8)

**Unit - II**

2. Write short notes on:
  - a) Machinability
  - b) Tool life and tool wear (16)

**OR**

2. a) Define cutting fluid and their roles. What are the types of cutting fluids used while machining. And what properties machinist looking into cutting fluids while selecting them. (8)

- b) Explain different materials, along with their properties, that can be used for making the cutting tools. (8)

### Unit - III

3. Define special purpose machine tool with examples. And write a short note on any two (16)
- a) capstan and turret lathe machine tool
  - b) tracer attachment in machine tools
  - c) Swiss automatic

### OR

3. a) Make a comparison between machine tools and machines. Discuss specifications of the following machine tools: (8)
- i) lathe
  - ii) drilling
  - iii) milling
  - iv) shaper
- b) Sketch a broaching tool and discuss various broaching operations. (8)

### Unit - IV

4. How grinding wheels are specified. And discuss various abrasives and bonding materials used for making of grinding wheels. (16)

### OR

4. Discuss various methods of thread manufacturing with sketches. (16)

### Unit - V

5. a) Enlist various gears finishing processes and testing methods and explain any two of each. (8)
- b) Enlist various high velocity forming methods and explain any two with sketch. (8)

OR

5. a) Enlist various gears manufacturing process and explain any two. (8)
- b) Enlist various precautions to be taken by operators for safe working on different machine tools. (8)
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4E4143

Roll No. \_\_\_\_\_

4E4143

Total No. of Pages : 4

B.Tech. IVsem(Main/Back) Examination, June/July- 2015

Mechanical Engg

4ME4 Design of Machine Elements-I

Common with Automobile

Time : 3 Hours

Maximum Marks : 80  
Min. Passing Marks : 26

**Instructions to Candidates:**

Attempt any **five** questions, selecting one question from **each unit**. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

**Unit - I**

1. a) What are the various types of fits? Explain them with the help of neat diagrams. (6)  
Give an example of each.
- b) Represent the following on a suitable diagram: Upper deviation, lower deviation, Fundamental deviation, Tolerance zone, Basic size (4)
- c) What precautions should be observed while designing a Forging. (4)
- d) The 'cost' factor influence the material selection. Explain. (2)

**OR**

1. a) Write a note on 'Design for Assembly'. (4)
- b) Manufacturing consideration is an important material selection criterion. Explain. (4)
- c) The surface roughness is limited by the manufacturing method used. Explain. (4)
- d) Explain the meaning of designation of the following steel: (4)  
i) 55 C8 ii) 16 Ni<sub>3</sub> Cr<sub>2</sub>

**Unit - II**

2. a) Compare ductile and brittle failure with the help of theories of failure. (4)

- b) Discuss the methods of stress concentration mitigation. Give suitable diagrams. (6)
- c) What types of stresses are induced in a cotter of the cotter joint when subjected to tensile load and also, give the expression for the respective resisting area along with suitable diagrams. (6)

OR

2. Design a knuckle joint to connect two round rods subjected to a tensile load of 100 kN. The permissible stresses may be taken as 75 MPa in tension, 50 MPa in shear and 135 MPa in crushing. (16)

Unit - III

3. a) Give steps to design a cantilever beam for stiffness. (6)
- b) What is the objective of nipping of leaf spring. (4)
- c) How the pin-joint at eye-end in the leaf spring is designed? (6)

OR

3. Design a cranked lever for the following data:

Length of handle = 200 mm

Length of the lever arm = 300 mm

Overhung of the shaft from the fournal = 50 mm

Effort applied by an average person = 400 N

The shaft is also to be designed. The permissible stresses are:

Lever:  $\sigma_t = 70 \text{ MPa}$ ,  $\tau = 50 \text{ MPa}$

Shaft:  $\tau = 40 \text{ MPa}$ ,  $\sigma_{cr} = 102 \text{ MPa}$

(16)

Unit - IV

4. Power is transmitted by a shaft 900 mm long and is supported at the ends. A pulley of diameter 420 mm is placed at 150 mm to the left of right hand bearing and another pulley of diameter 270 mm is mounted midway between the bearings. Determine the diameter of the shaft transmitting 24 kW at 300 rpm using both maximum shear stress theory and maximum normal stress theory.

The permissible tensile and shear stresses for shaft material are 120 MPa and 80 MPa respectively. The belt drives are at right angles to each other with tensions ratio as 3:1

(16)

215

(12)

OR

4. a) Design a muff coupling to transmit 6.5 kW at 1000 rpm. The permissible shear stress for shaft, key & muff is 50 MPa and permissible crushing stress for key is 120 MPa. (10)
- b) For a rigid flange coupling (shaft diameter 'd') transmitting torque T, give design equation/procedure to calculate:
- Flange thickness
  - Bolt diameter
- (6)

Unit - V

5. a) Find the diameter of bolts used to connect the bracket as shown in Figure.1  
Given:  $l=650$  mm,  $a=100$  mm,  $b=150$  mm,  $p=5$  kN The permissible shear stress is 40 MPa. (10)
- b) What are the different types of stresses induced in the bolts due to initial tightening and give their expressions. (6)

OR

5. a) What is self-locking screw? How is it achieved? (4)
- b) A U-frame, made of cast steel, has a maximum force of 70 kN as shown in Figure 2. The cross-section of the frame is  $125 \times b$  (rectangular). Determine the dimension 'b'. Using straight beam formulae and curved beam formula. Take stress concentration/correction factor a 1.4. The permissible tensile stress is 100 MPa. (12)

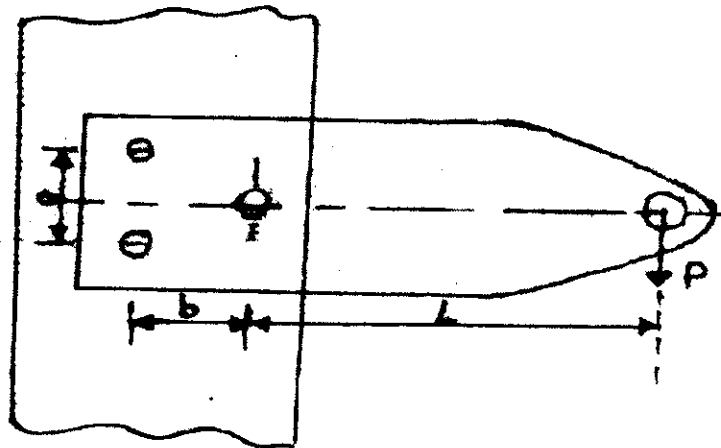


Figure-1

(Q.5 a)

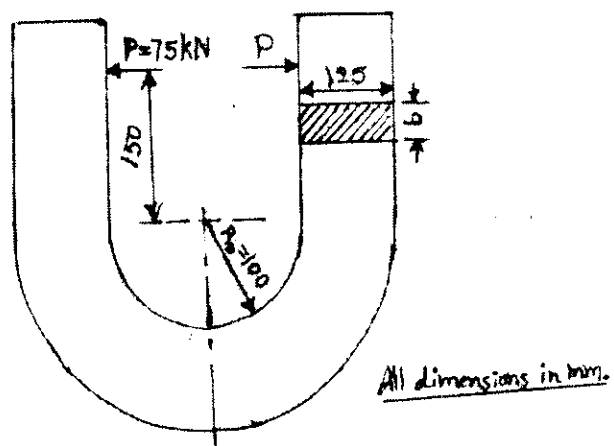


Figure -2

(Q.5 b OR)



4E4144	Roll No. _____	Total No. of Pages : 3
	4E4144	
	B.Tech. IV Semester (Main/Back) Examination, June/July - 2015	
	Mechanical Engineering 4ME5 Industrial Engineering Common with Automobile	

Time : 3 Hours

Maximum Marks : 80  
Min. Passing Marks : 26

**Instructions to Candidates:**

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**Unit - I**

1. a) What is industrial engineering? Discuss the role of industrial engineer? (8)
- b) Discuss the contribution of following in the development of industrial management:
  - 1) F. B. Gilbreth
  - 2) H.L. Gannt

**OR**

1. a) Discuss the concept of Productivity? How productivity can be measure and improve? (8)
- b) What is work study? Discuss the difference between method study and time study? (8)

**Unit - II**

2. a) Name the various techniques of work measurement and explain stop watch time study and work sampling in brief. (8)
- b) Following data refers to a work sampling study of a long cycle non repetitive operation.

Total time of study = 10 days;

Total number of observations = 1200;

Observation of production activity = 900;

Manually controlled elements = 600;

M/C Controlled elements = 300;

Total units produced = 4000 pieces;

Rating index = 110%;

Allowances = 13% of the normal time.

Assuming that study was made for 6 hrs per day, Calculate the standard time. (8)

**OR**

2. a) Name and describe the various levels of management with their functions. (6)  
b) What is management and discuss the objective of management? Explain the principles of scientific management. (10)

**Unit - III**

3. a) Differentiate between proprietorship and partnership business. (8)  
b) Differentiate between line organization and function organization. (8)

**OR**

3. a) Discuss the following sources of finance:  
i) Debentures.  
ii) Equity shares. (8)  
b) Describe briefly:  
i) Liabilities  
ii) Assets  
iii) Balance sheet  
iv) Profit and loss statement. (8)

**Unit - IV**

4. Explain the following financial ratios with their significance:  
a) Liquidity Ratio  
b) Equity Ratio  
c) Inventory Ratio  
d) Profit-Investment Ratio. (16)

(124)

**OR**

4. a) Discuss the payback period? Discuss the advantage and disadvantage of payback period. (8)
- b) The yearly cost of two machines A and B when money value is neglected is as follows:

Year	1	2	3	4	5
Machine A	1800	1200	1400	1600	1000
Machine B	2800	200	1400	1100	600

If the money value is 10% per year, find which machine is economical? (8)

**Unit - V**

5. a) What is Depreciation? Explain any two methods of calculating Depreciation. (8)
- b) An Industrial plant started with initial value of Rs. 2,00,000 and salvage value of Rs. 20,000 at the end of 20 years but sold for Rs. 1,45,000 at the end of 10 years. What is the profit and loss if sinking fund method is adopted and interest charged at 9% is compounded annually? (8)

**OR**

5. a) Describe Break-Even Chart and Explain the following terms,
- i) Margin of safety.
  - ii) Profit-volume ratio with their uses. (8)
- b) The fixed cost for the year 1985-86 are Rs. 10,00,000 and variable cost per unit is Rs. 50. The estimated sales revenues are Rs. 25,00,000. Each unit sells at Rs. 225 each:
- i) Find B.E.P. (in sales)
  - ii) If Rs. 20,00,000 will be the likely sales turn over for the next budget period, calculate the contribution and profit. (8)



4E4145

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

4E4145

**B.Tech. IV Semester (Main/Back) Examination, June/July - 2015****Mechanical Engg.****4ME6A I.C. Engines****Common with Automobile****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****Instructions to Candidates:**

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**Unit - I**

- Describe with a suitable neat sketch the two stroke cycle spark ignition engine. How its indicator diagram differ from that of four stroke cycle spark ignition engine? (16)

**OR**

- A single cylinder 4-stroke diesel engine gave the following results while running on full load:  
 Area of indicator card = 300mm<sup>2</sup>  
 Length of diagram = 40 mm  
 Spring constant = 1 bar/mm  
 Speed of the engine = 400 r.p.m.  
 Load on the brake = 370 N  
 Spring balance reading = 50 N  
 Diameter of brake drum = 1.2 m  
 Fuel consumption = 2.8 kg/h  
 Calorific value of fuel = 41800 KJ/kg  
 Diameter of the cylinder = 160 mm  
 Stroke of the piston = 200 mm  
 Calculate :

- i) Indicated mean effective pressure
- ii) Brake power and brake mean effective pressure
- iii) Brake specific fuel consumption
- iv) Brake Thermal efficiency
- v) Indicated thermal efficiency (16)

### Unit - II

- 2. a) Explain the effect of engine variables on ignition lag in S.I. Engine (8)
- b) Explain in briefly the stages of combustion in CI engine. What is the basic difference in the combustion processes of SI and CI engine? (8)

### OR

- 2. a) What are the desirable properties of good I.C. engines fuels? (8)
- b) State the advantages and disadvantages of hydrogen as I.C. engine fuel. (8)

### Unit - III

- 3. a) What are the basic requirements of a SI system? Describe working of SI system used in 4-cylinder petrol engines. (8)
- b) What are the requirements of a DI system? Compare air and solid injection. (8)

### OR

- 3. a) What do you understand by 'ignition timing'? Enumerate the various factors which affect ignition timings. (8)
- b) Write the short note on 'firing order'. (8)

### Unit - IV

- 4. a) Enumerate lubrication system and explain wet sump lubrication system with the help of a neat sketch. (8)
- b) Describe with neat sketch the cooling system of a 4-stroke SI engine used in car-What are the components used in cooling system? (8)

### OR

- 4. a) Describe with neat sketch the different methods of supercharging. Explain thermodynamics cycle of supercharging. (8)
- b) Explain the scavenging processes in 2-stroke engine. What is mean by 'blow down'? (8)

**Unit - V**

5. a) Describe the stages of combustion in a dual fuel engine when gaseous fuel is injected in small quantity near the top dead centre. (8)
- b) What is the effect of variable compression ratio on power output, thermal load, specific fuel consumption and engine noise? (8)

**OR**

5. a) What is a multi-fuel engine? What are the requirements of a multi-fuel engine? (8)
- b) What constitutes a 'free piston engine'? Why is it called 'free piston'? Describe with a neat sketch the working of a 'free piston engine'. (8)
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	<b>4E4148</b>	
	<b>B.Tech. IVsem(Main/Back) Examination, June/July - 2015</b>	
	<b>Automobile Engineering</b> <b>4AE2A Fluid Mechanics &amp; Machines</b> <b>AE,ME</b>	

**Time : 3 Hours**

**Maximum Marks : 80**  
**Min. Passing Marks : 26**

**Instructions to Candidates:**

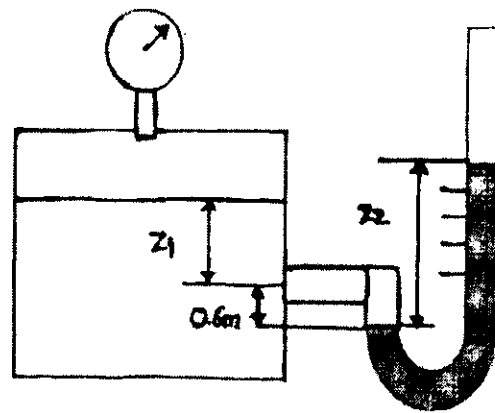
*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

**Unit - I**

1. a) Define the necessary condition for stability and floating bodies considering a suitable example. (6)
- b) A dock gate 10m wide has sea depths of 6m and 15m on its two sides respectively. The relative density of seawater is 1.03. Calculate the resultant force acting on the gate due to the water pressure and find the position of the centre of pressure relative to the bottom of the gate. (10)

**OR**

1. a) Prove that the position of centre of pressure is always below the centre of gravity considering any suitable example. (6)
- b) A U-tube manometer is connected to a closed tank as shown in figure, containing oil having a density of  $860 \text{ kg/m}^3$ , the pressure of the air above the oil being 3500 Pa. If the pressure at point A in the oil is 14000 Pa and the manometer fluid had a RD of 3, determine
  - i) the depth of oil,  $z_1$  and
  - ii) The differential reading,  $z_2$  on the manometer. (10)



### Unit - II

2. a) A 20 mm diam pipe split into two parts, one branch being 10 mm in diameter and the other is 15 mm in diameter. If the velocity in the 10 mm pipe is 0.3 m/s and in the other pipe is 0.6 m/s, calculate the rate of flow in  $\text{cm}^3/\text{s}$  and the velocity in the 20 mm diameter pipe. (8)
- b) Derive Euler equation motion in rectangular Cartesian coordinates system. (8)

OR

2. a) Briefly explain the following terms, Reynolds transport theorem and Bernoulli's equation. (8)
- b) Water at 36 m sea level has a velocity of 18 m/s and pressure of 350  $\text{kN/m}^2$ . Determine the potential, kinetic and pressure energies of the water in meters of head and determine the total head. (8)

### Unit - III

3. a) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe. (8)
- b) An oil having viscosity of 1.42 poise and specific gravity 0.9 flows through a pipe 25 mm diameter and 300 m long at Reynolds number of 1800. Find the flow through the pipe and the power required to maintain the flow. (8)

OR

3. a) What are the causes which result in separation of boundary layer. (8)
- b) Derive the expression for velocity variation for a laminar incompressible flow in a circular pipe.
- c) Glycerine of viscosity 0.88  $\text{N/m}^2$  and specific gravity 1.26 is pumped through a horizontal pipe of diameter 30 mm at a flow rate of 50  $\text{lit/min}$ . Determine whether the flow is laminar or turbulent. Find also the pressure loss due to the

frictional resistance in a length of 10 m and the power required. (8)

#### Unit - IV

4. a) Explain the working of any one measurement devices from venturimeter and orificemeter each. (8)
- b) A pipe line, 16 km long, supplies 40 million liters of water per day to city. The first 5 km length of the pipe is of 1 m diameter and the remaining part is 80 cm. diameter pipe. If the water to the city is to be supplied as a residual head of 15 m of water calculate the supply head at the inlet end. Neglect minor losses and assume  $f = 0.03$  for the entire pipeline. Sketch the hydraulic gradient for the pipe line. (8)

#### OR

4. a) Oil of viscosity 0.2 Pa-S and Specific gravity of 0.8 flows through a 150 mm diameter pipe. If the head loss in 2000 m length pipe is 25 m, estimate
- Shear stress along the pipe,
  - Shear stress at a radial distance of 50 mm from the axis of the pipe,
  - Velocity at radial distance of 25 mm from the axis of the pipe,
  - Discharge through the pipe, (12)
- b) Explain various energy losses in pipes. (4)

#### Unit - V

5. a) Draw a schematic diagram of Francis turbine and explain its working illustrating all the parts of the turbine. (8)
- b) A Pelton turbine is receiving water from a penstock with a head of 510 m. One third of the head is lost in the penstock. The rate of flow through the nozzle fitted in the end of the penstock is  $2.2 \text{ m}^3/\text{s}$ . The angle of deflection of the jet is  $165^\circ$ . Determine the power given by the water to the runner and hydraulic efficiency of the Pelton wheel take  $c_v = 1$  and speed ratio is 0.45. (8)

#### OR

5. a) Explain in details about the following efficiencies of the centrifugal pump; Manometric, Volumetric and overall efficiency. (4)
- b) Describe the following hydraulic system in details describing their working; Hydraulic Accumulator, Hydraulic Intensifier, Hydraulic Coupling and hydraulic torque converter. (12)



4E2050	Roll No. _____	Total No. of Pages : <span style="border: 1px solid black; padding: 2px 5px;">3</span>
	4E2050	
	B.Tech. IVsem(Back) Examination, June/July - 2015	
	Mechanical Engg. 4ME2 Automobile Engineering	
Time : 3 Hours		Maximum Marks : 80 Min. Passing Marks : 24

**Instructions to Candidates:**

Attempt any **five** questions, selecting **one** question from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

**Unit - I**

1. a) Explain the working of multiplate dry clutch. Why do we use multiplate clutch. (8)
- b) The partial vacuum generated in the engine manifold is useful for the transmission system. Discuss with neat diagram. (8)

**OR**

1. a) Explain the working of an electromagnetic clutch. Also explain its merits and demerits. (8)
- b) ~~Write~~ short notes on:
  - i) Materials of frame
  - ii) Subframes
  - iii) Frames
  - iv) Defects in frames

(2×4=8)

**Unit - II**

2. a) Explain the working of synchromesh gear box in detail. (8)  
b) Explain with the help of neat diagram the construction of a propeller shaft. (8)

**OR**

2. a) Describe the working principle of an epicycle gear box with neat diagram. (8)  
b) Write short notes on:  
i) Hotch kiss Drive  
ii) Torque tube drives (4×2=8)

**Unit - III**

3. a) Explain the construction and working of a telescopic type shock absorber. (8)  
b) Explain the working principle of "power steering". Compare integral power steering with linkage power steering. (8)

**OR**

3. a) Why do we require an automobile brake? Discuss the various factors influencing braking effect. (8)  
b) Draw cross section of an automobile tyre and show on it the various constructional features. (8)

**Unit - IV**

4. a) Discuss briefly on Magneto and Coil ignition systems. (8)  
b) How is charging and testing of a battery done. (8)

**OR**

4. a) Explain the working principle of 'Alternator'. Discuss the construction with neat diagram. (8)  
b) Write short notes on:  
i) Generator (Dynamo)  
ii) Automotive electrical system. (4×2=8)

**Unit - V**

5. a) What do you understand from 'Active' safety features and 'passive' safety features? (8)
- b) Explain briefly about night vision system (NVS) and Global positioning system (GPS). (8)

**OR**

5. a) Discuss briefly about the various safety devices used in an automobile. (8)
- b) Discuss the working principle of various prominent tracking systems. (8)
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4E 2054	Roll No. _____	[Total No. of Pages : 4]
	<b>4E 2054</b>	
	<b>B.Tech. IV Semester (Back) Examination, June/July - 2015</b>	
	<b>Mechanical Engg.</b> <b>4ME6 Measurements &amp; Control</b> <b>Common for Mech., &amp; Automobile Engg.</b>	

**Time : 3 Hours**

**Maximum Marks : 80**  
**Min. Passing Marks : 24**

**Instructions to Candidates:**

*Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)*

**Unit - I**

1. a) Draw the block diagram of generalized instrumentation system. Identify various elements and explain the function of each in brief (8)
- b) What is temperature compensation and how it is achieved? Explain with the help of suitable diagram (8)

**OR**

1. a) Explain different strain gauge circuits. Derive the formula to find gauge factor of strain gauge (8)
- b) Write short notes on
  - i) Calibration
  - ii) Accuracy and precision (8)

**Unit - II**

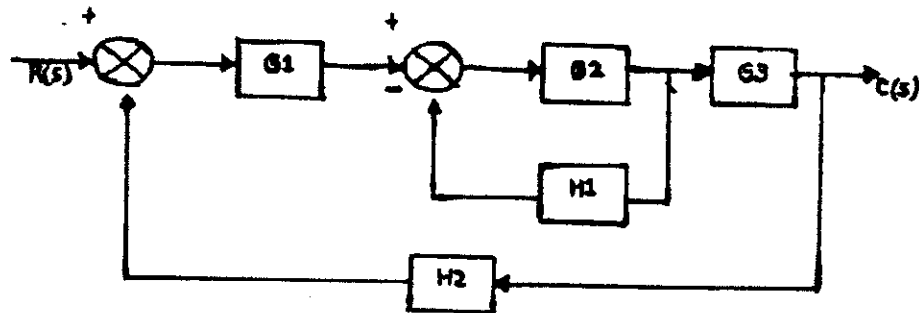
2. a) List the various factors which affect the selection of a transducer (8)
- b) Give classification of transducer with example (8)

**OR**

2. a) List various transducers which are used for measurement of temperature. Explain any one in detail (8)
- b) Explain construction working principle and application of LVDT (8)

### Unit - III

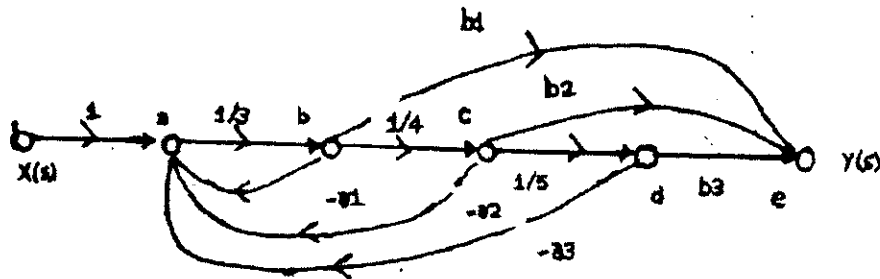
3. a) Differentiate between open loop and close loop control system with the help of suitable example (two each) (8)
- b) Derive overall transfer function of the system using block diagram reduction technique



(8)

OR

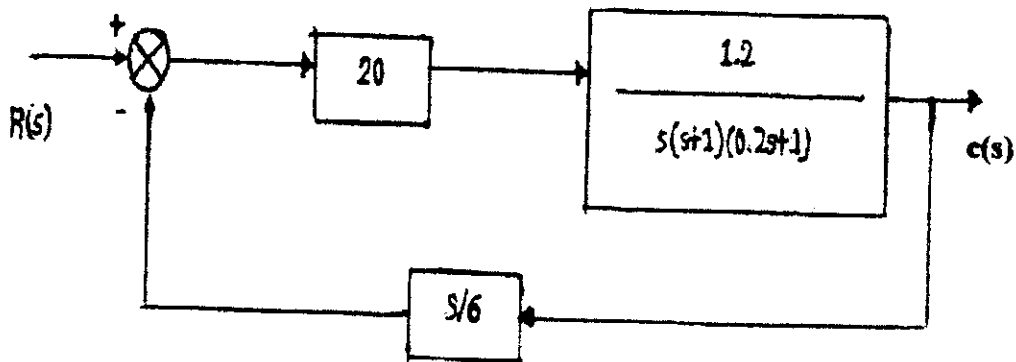
3. a) Draw the block diagram of a digital data acquisition system and explain its each element in detail (8)
- b) Drive the transfer function of following system by signal flow graph method



(8)

### Unit - IV

4. The block diagram of a simple servo system shown as (16)



Find:

- The characteristic equation of system
- Undamped and damped frequency of oscillation
- Damping ratio and damping factor
- Maximum overshoot
- First under shoot(f) setting time
- Time after which maximum and minimum occurs

OR

4. Write short note on

- Thermal system
  - Pneumatic system
- Using force voltage analogy prove that the mechanical system of following fig(a) will be analogous to the electrical circuit of fig(b)

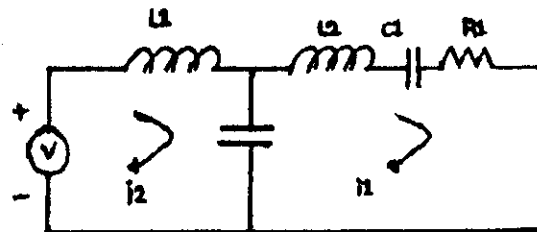
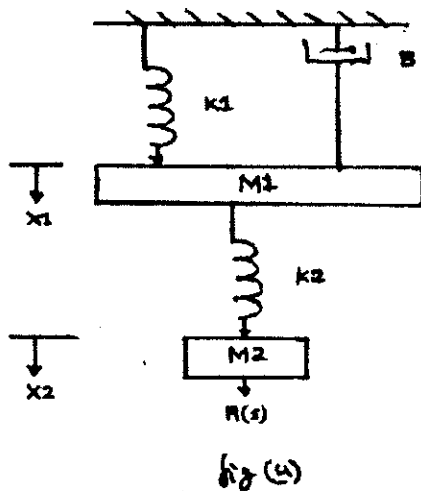


fig (b)

(8)

Unit - V

- Comments upon the stability of the systems have following characteristic equation
  - $s^5 + s^4 + 2s^3 + 2s^2 + 1s + 10 = 0$
    - $s^6 + 2s^5 + 8s^4 + 15s^3 + 20s^2 + 16s + 16 = 0$
  - Explain Nyquist stability criterion with the help of any example

OR

5. a) A unity feedback control system has  $G(s) = \frac{1000}{s^2(s+2)(s+5)}$  and  $H(s)=1$ , draw bode plot (8)
- b) Write short note on:-
- i) Constant M-circle and N-Circle
  - ii) Rules of construction of root locus (8)
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