5E3175

Roll No. ___________ Total No of Pages: 4

5E3175

B. Tech V Sem. (Old Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME1(O) Advanced Mechanics of Solids

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) The state of stress at a point is characterized by the components -

$\sigma_x = 12.31, \sigma_y = 8.96, \sigma_z = 4.34$

$\tau_{xy} = 4.20, \tau_{yz} = 5.27, \tau_{zx} = 0.84$

Find the values of the principal stress and directions of maximum principal stress. [10]

(b) Derive the Cauchy's stress formula for any arbitrary plane. [6]

OR

Q.1 (a) Find the conditions of stress acting on the body which must be satisfied when they vary from point to point. [8]

(b) What do you mean by principal plane and stresses? Derive the principal characteristics equation. [8]

UNIT-II

Q.2 (a) The following displacement field is imposed on a body.

$u\,(xy\vec{i} + 3x^2z\vec{j} + 4\vec{k})10^{-1}$

Consider a point P and a neighboring point Q where PQ has the following direction cosines,

$\eta_x = 0.200,\quad \eta_y = 0.800,\quad \eta_z = 0.555$

Point p has coordinates (2, 1, 3).

If PQ = Δ S, Find the components of P' Q' after deformation. [10]

(b) Let Q be the neighboring point of any point P (x, y, z). How do you describe the deformation of Q with respect to point P? [6]

OR

Q.2 (a) Consider the displacement field $u = [y^2\vec{i} + 3yz\vec{j} + (4+6x^2)\vec{k}]10^{-1}$

What are the rectangular strain components at the point P (1, 0, 2)? Use only linear terms. [6]

(b) Derive the characteristics equation for principal strains using strain invariants. [10]

UNIT-III

Q.3 (a) What do you mean by isotropic and homogeneous materials? Define and derive stress strain relations for an isotropic material. [8]

(b) The state of stress at a point is characterized by the components:-

$\sigma_x = 200$ MPa, $\sigma_y = -80$ MPa and $\sigma_z = 160$ MPa

$\zeta_{xy} = \zeta_{yz} = \zeta_{zx} = 0$

Determiner the extreme values of the shear stresses, their associated normal stresses, the octahedral shear stress and its associated normal stress. [8]

OR

Q.3 (a) Derive lami's displacement equations of equilibrium. [8]

(b) For steel, the following data is applicable.

$E = 207 \times 10^6$ KPa

$a = 80 \times 10^6$ KPa

For the given strain matrix at a point, determine the stress matrix. [8]

$$[E_{ij}] = \begin{bmatrix} 0.001 & 0 & -0.002 \\ 0 & -0.003 & 0.0003 \\ -0.002 & 0.003 & 0 \end{bmatrix}$$

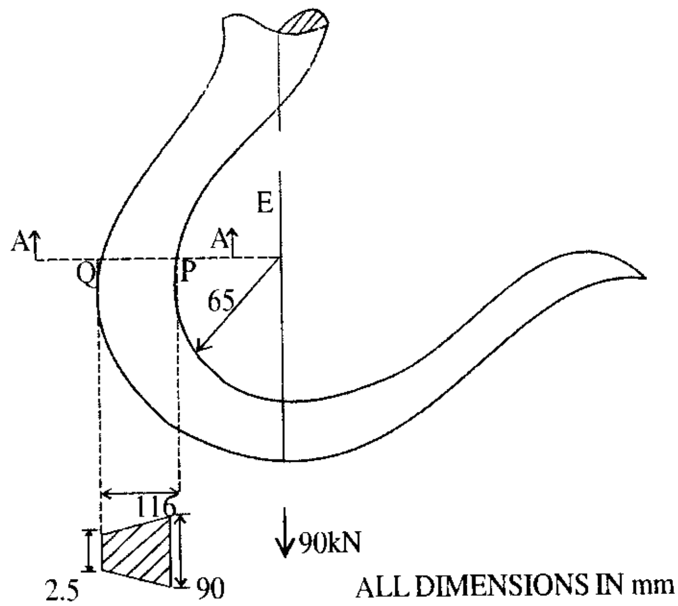
UNIT-IV

Q.4 (a) Find the general expression for bending stress in curved beam having large curvature. [10]

(b) Find out the shear centre of any rectangular beam. [6]

OR

Q.4 A crane hook has a trapezoidal section at A – A as shown in fig. Find the maximum stress at points P and Q. [16]



UNIT-V

Q.5 (a) Find the general expression for hoop stress and radial pressure in a thick cylindrical shell. [10]

(b) Explain the effects of internal pressure on the dimension of a thin cylindrical shell. [6]

OR

Q.5 (a) Find the thickness of metal necessary for a cylindrical shell of internal diameter 160 mm to withstand an internal pressure of $8 N/mm^2$. The maximum hoop stress in the section is not to exceed $35 N/mm^2$. [8]

(b) The hoop stress is minimum at the outer surface and is maximum at the inner surface of a thick cylinder. Prove this statement. [8]

5E3177	Roll No. ______	Total No of Pages: 3

5E3177

B. Tech V Sem. (Old Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME3 (O) Fundamentals of Aerodynamics

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1."Gas Table" 2. NIL

UNIT-I

Q.1 (a) What are the sources of aerodynamics forces and moment over the body surface? Explain in detail. [8]

(b) Give nomenclature of aerofoil and define - [8]

(i) Angle of attack

(ii) Drag force

OR

Q.1 (a) Derive the expression of aerodynamics moment for an airfoil about the leading edge. [8]

(b) Derive the Kelvin's circulation theorem mathematically. [8]

UNIT-II

Q.2 (a) Derive the expression for lift coefficient and drag coefficient for the cascade of an axial compressor. [8]

(b) Explain the concept of vortex sheet for simulation of airfoil theory. [8]

OR

Q.2 (a) A compressor cascade has following data: [8]

Velocity of air at entry 75 m/s, air angle at entry 48°, Air angle at exit = 25°, pitch chord ratio = 1.1, stagnation pressure loss = 11mm, density of air = 1.25 kg/m°. Determine loss coefficient, drag and lift coefficient.

(b) What are the cascade losses? [8]

UNIT-III

Q.3 (a) Derive the following relation for one-dimensional isentropic flow- [8]

$$\frac{dA}{A} = \frac{dP}{\varphi c^2} \left(1 - M^2\right)$$

(b) Prove that the mass flow parameter is given by the following expression [8]

$$\frac{m^{*} \sqrt{To}}{A^{*} Po} = \left(\frac{V}{R}\right)^{1/2} \frac{M}{\left[1+\frac{V-1}{2} M^2\right]^{\frac{V+1}{2(V-1)}}}$$

OR

Q.3 The following data is given for an ideal thrust chamber, K = 1.3, chamber pressure 25 bar, external pressure 0.88 bar, chamber temperature 2900°C, throat area 13 cm^2, Determine - [16]

(i) throat velocity

(ii) Propellant flow

(iii) Mach. No. at exit.

UNIT-IV

Q.4 (a) Prove that at maximum entropy point for the Fanno Flow Mach Number is unity and all processes approach this point. [8]

(b) Air at Po = 10 bar, To = 400k is supplied to a 50 mm diameter pipe. The friction factor for the pipe surface is 0.002. If the Mach Number changes from 3 to 1.0 at the exit, determine - [8]

(i) The length of pipe

(ii) The mass flow rate

OR

Q.4 Prove that the Mach number at the maximum enthalpy and maximum entropy point on the Rayleigh line are $1/\sqrt{\gamma}$ and 1.0 respectively. Show the h=constant and S = constant lines at these points on the Rayleigh line on the h-5 and P-v planes. [16]

UNIT-V

Q.5 (a) Derive the equation for Rankine – Hugonoit relation for normal shock. [8]

(b) Derive the equation for static pressure ratio across the shock. [8]

OR

Q.5 (a) Derive the following relationship for a normal shock wave - [8]

$C_x . C_y = (a^*)2$, where

C_x = velocity before shock, C_y = velocity after shock, a^* = critical velocity of sound.

(b) Consider a normal shock wave in a supersonic air stream where the pressure upstream of the shock is 1 atm. Calculate the loss of total pressure across the shock wave when the upstream Mach number is M_1=2. [8]

5E3178

Roll No. ___________

Total No of Pages: 4

5E3178

B. Tech V Sem. (Old Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME4 (O) Industrial Engineering-I

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Discuss the contribution of H.L.Gantt & F.Filbreth made in management thoughts. [8]

(b) Describe the principles of Scientific Management, in brief. [8]

OR

Q.1 (a) Explain in brief the main contribution of Henry Fayal to the management. [8]

(b) Differentiate administration and management. Discuss different levels of management. [8]

UNIT-II

Q.2 (a) Describe Partnership Organization with its merits & demerits. [8]

(b) Compare between "Co-operative Society" &"Joint stock Company". [8]

OR

Q.2 (a) Write short notes on span of control (Graicuna's theory). [3]

(b) List the distinguishing characteristics of line type organization & staff type organization. [8]

UNIT-III

Q.3 (a) Explain in detail the kinds of capital sources of fixed capital shares. [8]

(b) The following is the summarized profit & loss account of the Garima Products Ltd., for the year ending 31st March, 2012 & the Balance Sheet as on that date:-

Profit & loss Account of the Garima Products Ltd. For the year Ending 31st march, 2012

	Rs		Rs
To opening Stock	1,99,000	By Sales	17,00,000
To purchases	10,90,500	By Closing Stock	2,98,000
To Incidental Charges	28,500		
To Gross Profit	6,80,000		
	19,98,000		19,98,000
To operating Expenses		By Gross Profit	
Administration	3,00,000	By Non- operating income	6,000
Selling & Distribution	60,000	By Profit on sales of shear	12,000
Finance	30,000		
	3,90,000		18,000
To Non-operating Expense			
Loss on Sales of Assets	8,000		
To Net Profit	3,00,000		
	6,98,000		6,98,000

Balance sheet of the Garima Products Ltd as on 31st march 2012.

	Rs		Rs
Issued capital			
4,000 Equity shears		Land & Building	3,00,000
of Rs 100/- each	4,00,000		
Reserve & Surplus	1,80,000	Plant & Machinery	1,60,000
Current Liabilities	2,60,000	Stock in Trade	2,98,000
Profit & loss A/C	1,20,000	Sundry Debtors	1,42,000
		Cash & Bank Balance	60,000
	9,60,000		9,60,000

From the above statement your are required to calculate the following ratios - [8]

(i) Current Ratio

(ii) Operating Ratio

(iii) Stock Turnover

(iv) Return on Total Resources

(v) Turnover of Fixed Assets.

OR

Q.3 Write Short Notes on (**Any four**) - [16]

(i) Surplus Profits

(ii) Equity Shares

(iii) Profit & Loss Statements

(iv) Ratio Analysis

(v) Profit investment ratio.

UNIT-IV

Q.4 (a) State the methods of calculating depreciation & explain any three of them. [8]

(b) Purchase price of an asset is Rs 20,000 & scrap value is Rs 2,000. The life of asset is 5 yrs. Calculate the book value of the asset at the end of second year by:

(i) Straight line method. [4]

(ii) Sum of years digits method. [4]

OR

Q.4 (a) Explain capital recovery annuity, present worth & sinking fund annuity methods. [8]

(b) The cost of an asset is Rs 50,000 & it has economic life of 10 years. Book value after 10 yrs is Rs, 4000. Calculate - [8]

(i) Rate of depreciation using Annuity Method.

(ii) Book Value of asset at the end of 2 year.

Take Rate of interest = 5%

UNIT-V

Q.5 Discuss the Factories Act 1944 with its Aims & Objectives. [16]

OR

Q.5 (a) Discuss Workmen's Compensation Act. [8]

(b) Explain Trade Unions. What are the objectives & functions of Trade Unions? [8]

5E3180	Roll No. ________	Total No of Pages: 4

5E3180

B. Tech V Sem. (Old Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME6 (O) Principles of Turbomachines

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Classify the turbo machine on the basis of direction of energy conversion. Derive the eulers expression for a turbo machine. [8]

(b) What do you understand by dimensional analysis? Also derive the dimensional parameters for a rotating machine. [8]

OR

Q.1 (a) Explain geometric, kinematic & dynamic similarities. State two governing parameters for each kind of similarity. [8]

(b) Derive expressions for the specific speed based on flow rate and power. [8]

UNIT-II

Q.2 (a) What are the characteristic curves of centrifugal pump? Derive the expression for the minimum speed for starting a centrifugal pump. [8]

(b) Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water. [8]

OR

Q.2 (a) How will you determine the possibility of cavitations to occur in the installation of a turbine or pump? [6]

(b) A centrifugal pump having outer diameter equal to the three times the inner diameter and running at 1000 r.p,m works against a total head of 40m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of impeller is 500 mm & width at outlet is 50 mm, determine: [10]

(i) Vane angle at inlet

(ii) Work done by impeller on water per second

(iii) Manometric efficiency.

UNIT-III

Q.3 (a) Explain the principle of operation, constructional detail and functioning of a typical axial flow pump. [6]

(b) An axial pump is designed to draw cold water. At design point flow entering it is rotation free. The suction and delivery side indication are 78,300 N/m^2 abs and 95,320 N/m^2 abs. the meridional velocity at two points may be taken as equal. Find:- [10]

(i) Specific speed of pump.

(ii) Discharge, if pump required 75KW to drive and overall efficiency is 0.9.

(iii) Impeller diameter, if speed ratio is 1.7, speed = 420 rpm and hub ratio is 0.6.

OR

Q.3 (a) What is cavitation? What are the bad effects of cavitation? Suggest way to reduce the occurrence of cavitation. [8]

(b) An axial flow pump is designed to work with solar photovoltaics cell system with $2.75 m^3/s$ and 9.3 m head, while running at 900 rpm. Assuming hub to runner diameter ratio as 0.55 and through velocity as 0.4 times the peripheral velocity, what will be the diameter, minimum speed ratio and pressure coefficients. [8]

UNIT-IV

Q.4 (a) Briefly explain with suitable diagram, how the blade shape affects the performance of compressor. [8]

(b) Briefly explain the flow through the following components:- [8]

(i) The inlet casing

(ii) The inducer

(iii) The impeller, and

(iv) The impeller channel

OR

Q.4 (a) With a neat sketch explain the inlet and outlet (exit) velocity triangles for various type of blades. Why diffusers are necessary in centrifugal compressors. [8]

(b) A centrifugal compressor runs at 8000 rmp and delivers 700 m^3/min of free air at a pressure ratio of 4:1, The isentropic efficiency of compressor is 88%. The outer diameter of impeller (having radial blades) is twice the inner one and neglect the slip coefficient. Assume that ambient air conditions are 1 bar and 293K. The axial velocity of flow is 70 m/s and is constant throughout. Determine - [8]

(i) Power input to compressor

(ii) Impeller diameter at inlet and outlet and width at inlet, and

(iii) Impeller and diffuser blade angles at inlet.

UNIT-V

Q.5 (a) What are the basic requirements of compressors for aircraft applications? Do axial flow compressors meet them? Explain. [8]

(b) Air enters an axial flow compressor at 1 bar and 20°C at low velocity. It is compressed through a pressure ratio of 11. Find the final temperature and pressure at outlet from compressor. Take compressor efficiency as 85% [8]

OR

Q.5 (a) Explain The following performance coefficient:- [8]

(i) Flow coefficient

(ii) Loading coefficient

(iii) Diffuser pressure loss coefficient

(iv) Rotor enthalpy loss coefficient

(b) Air at 1.0132 bar and 288K enters an axial flow compressor stage with an axial velocity 150 m/s. There are no inlet guide vanes. The rotor stage has a hip diameter of 60 cm and a hub diameter of 50 cm and rotates at 100 rpm. The air enters the rotor and leaves the stator in the axial direction with no change in velocity or radius. The air is turned through 30.2° as it passes through rotor. Assume a stage pressure ratio of 1.2. Assuming the constant specific heats and that air enters and leaves the blade at the blade angles -

(i) construct the velocity diagram at mean dia for this stage.

(ii) find mass flow rate

(iii) find power required, and

(iv) find degree of reaction [8]

5E6201

Roll No. ____________ Total No of Pages: 4

5E6201

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME1A Heat Transfer
Common with AE

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Explain the physical mechanism of heat transfer by - [8]

(i) Conduction.

(ii) Convection, and

(iii) Radiation.

(b) What is thermal conductivity? How thermal conductivity varies for solids, liquids and gases? [8]

OR

Q.1 (a) Define the role of general 3-dimensional conduction equation in spherical coordinates, also generate heat conduction equation across a spherical shell. [8]

(b) A copper pipe carrying refrigerant at -20°C is 10mm in OD and is exposed to convection at 50 W/m^2K to air at 25°C. It is proposed to apply insulation of conductivity 0.5 W/mK. Determine the thickness beyond which the heat gain will be reduced. Calculate the heat gains for 2.5mm, 5.0 mm and 7.5mm thickness for 1m length. The convection coefficient remains constant. [8]

UNIT-II

Q.2 (a) Derive an expression for general differential equation of fin. [8]

(b) Explain about Heisler chart for a long cylinder. Discuss variable parameters for Heisler chart. [8]

OR

Q.2 (a) Write the Navier- Stokes equations for convection. How these are useful for energy problems? [8]

(b) Water at 20°C flows through a small-bore tube, 1mm in diameter at a uniform speed of 0.2 m/s. The flow is fully developed at a point beyond which a constant heat flux of 6000 W/m_2 is imposed. How much further down the tube will the water reach 74°C at its hottest point? [8]

UNIT-III

Q.3 (a) What is natural convection? Explain its different mechanisms with suitable examples. [8]

(b) An dir duct carries chilled air at an inlet bulk temperature of T_{bin} = 17°C and a speed of 1m/s. The duct made of thin galvanized steel, has a square cross section of 0.3m by 0.3m, and is not insulated. A length of the duct 15m long runs outdoors through warm air at T_{∞} = 37°C. The heat transfer coefficient on the outside surface, due to natural convection and thermal radiation, is 5 W/m^2K. Find the bulk temperature change of the air over this length. [8]

OR

Q.3 (a) What is vaporization? Discuss effect of various parameters on vaporization. [8]

(b) What is q_{max} in mercury on a large flat plate at 1 atm? Also give your comment.

Hint:-

The normal boiling point of mercury is 355°C. At this temperature –

h_{fg}=2,92,500 J/kg, ρ_f = 13,400 kg/m^3, ρ_g=4.0 kg/m^3 and σ = 0.418 kg/s^2. [8]

UNIT-IV

Q.4 (a) Derive an expression of LMTD for counter flow heat exchanger. Also discuss about LMTD correction factor. [8]

(b) Consider the following parallel-flow heat exchanger specification-

Cold flow enters at 40°C: C_c = 20,000 W/K.

Hot flow enters at 150°C: C_h = 10,000 W/K.

A = 30 m^2, U = 500 W/m^{2}K.

Determine the heat transfer and the exit temperatures. [8]

OR

Q.4 (a) On which parameters, the effectiveness of heat exchanger depends and how? [8]

(b) Discuss various constructional and manufacturing aspects of heat exchangers. [8]

UNIT-V

Q.5 (a) Differentiate the Plank distribution law and Krichoff's law with respect to their applications and boundary conditions. [8]

(b) A black thermocouple measures the temperature in a chamber with black walls. If the air around the thermocouple is at 20°C, the walls are at 100°C and the heat transfer coefficient between the thermocouple and the air is 75 W/m^{2}K, what temperature will the thermocouple read? [8]

OR

Q.5 (a) What is shape factor? Discuss role of it, for thermal resistance, thermal conductivity and heat transfer. [8]

(b) Discuss the role of reradiating surfaces on heat transfer. Which parameters affect the reradiating surfaces and how? [8]

5E6202	Roll No. ___________ Total No of Pages: 4

5E6202

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME2A Dynamics of Machines

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks Main: 26
Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Describe Hartnell Governor with help of a neat sketch. Derive an expression to determine spring stiffness of a Hartnell Governor. [8]

(b) What is the controlling force of a governor? How does the controlling force curve help in deciding stability of a governor? [8]

OR

Q.1 (a) Differentiate between functions of a fly wheel and a governor. [8]

(b) A porter governor has four arms, each 240 mm long. The upper arms are attached to axis of rotation, and lower arms are attached to sleeve at a distance of 40 mm from axis of rotation The revolving ball weighs 25N and sleeve weighs 200N. If the maximum and minimum radius of rotation are 180 mm and 140 mm respectively, determine the range of speed. [8]

UNIT-II

Q.2 (a) Discuss stability of a two wheeler negotiating a curve. [8]

(b) A punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at a rate of 30 holes per minute. It requires 6 N-m of energy per mm^2 sheared area. Determine the moment of inertia of the flywheel if punching takes one-tenth of a second and speed of flywheel varies from 160 rpm to 140 rpm. [8]

OR

Q.2 A four wheeler of mass 2200 kg has a wheel base 2.5 m, track width 1.5 m and height of centre of gravity 0.5 m above the ground level. The centre of gravity lies at 1.0 m from front axle. Each wheel has effective diameter 0.8 m and moment of inertia 0.9 kg m^2. If the vehicle takes a right tern of 60 m radius at 60 kmph, calculate load on each wheel. [16]

UNIT-III

Q.3 (a) Present a comparison between cycloidal and involute tooth profiles. [8]

(b) For a spur gear drive, establish an expression for path of contact and arc of contact. [8]

OR

Q.3 Two 3 mm module, 20° pressure angle involute spur gears mesh externally to give a velocity ratio of 4. The addendum is 1.2 times module. The pinion rotates at 150 rpm. Determine - [16]

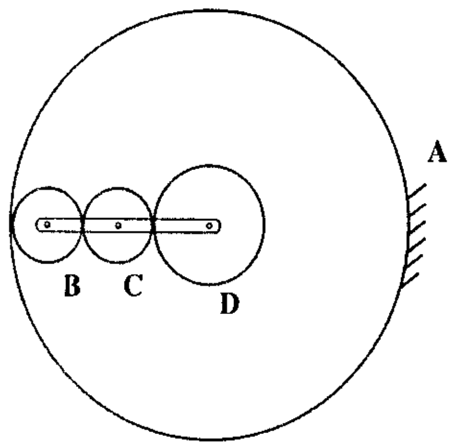
(a) Minimum no. of teeth or pinion

(b) Number of pairs of teeth in contact.

UNIT-IV

Q.4 (a) Derive an expression for speed ratio of compound gear train. [6]

(b) An epicyclic train as shown is figure is composed of a fixed annular wheel A having 150 teeth. Gear B and Gear C are carried on an arm E having 25 teeth and 20 teeth respectively. Determine no. of teeth on gear D and speed of rotation of Arm E, if D rotates at 300 rpm clockwise. [10]



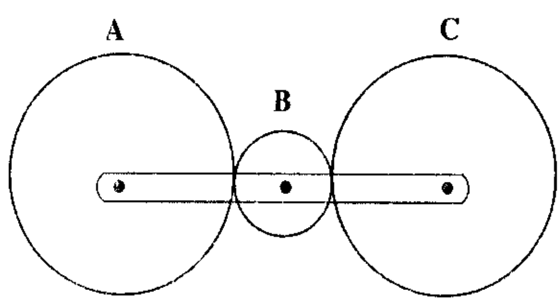
OR

Q.4 (a) What is fixing torque in epicyclic gear train? How can it be determined? [6]

(b) In an epicyclic gear train, as shown in figure, the number of teeth on gear A, B and C are 50, 25 and 55 respectively. The arm rotates at 450 rpm clockwise. Calculate - [10]

(i) Speed of gear C when A is fixed and

(ii) Speed of gear A when C is fixed.



UNIT-V

Q.5 (a) Discuss Hammer blow and variation of tractive effort. [8]

(b) Analyse the balancing of a 2 cylinder V engine with stroke lines placed at 90° to each other. [8]

OR

Q.5 (a) Explain the concept of Direct and Reverse cranks in radial engines. [8]

(b) A shaft of span 3 m between two bearings carries two masses of 15 and 30 kg acting at extremities of arms 0.5 m and 0.6 m respectively. The planes in which these masses rotate are 1 m and 2 m respectively from the left end bearing. The angle between two arms is 60°. The balancing is to be achieved by two balance masses rotating at radii of 0.25 m and placed at 0.3 from each bearing centre. Determine balance masses and their angular positions with respect to 15 kg mass. [8]

5E6203

Roll No. ___________ Total No of Pages: 3

5E6203

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME3A Measurement & Metrology
Common with PI

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) Explain accuracy and precision with suitable examples. [8]

(b) Define error in measurement. Explain various types of errors in measurement. [8]

OR

Q.1 Write brief notes on following: [4×4=16]

(a) Correction

(b) Calibration

(c) Interchangeability

(d) Repeatability and reproducibility

UNIT-II

Q.2 Enlist various types of comparators. And explain working of electrical and mechanical comparator with sketches. [16]

OR

Q.2 Write brief notes on following: [4×4=16]

(a) Micrometer

(b) Slip gauges

(c) Optical flat

(d) Sine bar

UNIT-III

Q.3 (a) Define any eight terms from screw thread terminology. [8]

(b) Calculate the effective diameter of screw if the diameter over standard cylinder with two wires is 15.64mm, diameter over plug screw gauge is 15.26mm, pitch thread is 2.5mm, wire diameter is 2mm and standard cylinder diameter is 18mm. [8]

OR

Q.3 (a) Explain any two direct methods of surface roughness measurement. [8]

(b) In the measurement of surface roughness, heights of 20 peaks and valleys were measured in microns from a datum over a length of 20 mm, calculate the CLA and RMS values for surface. [4+4=8]

35, 25, 40, 22, 35, 18, 42, 25, 35, 22, 36, 18, 42, 22, 32, 21, 37, 18, 35, 20

UNIT-IV

Q.4 (a) What are CMM probes? Explain various types of CMM probes. [8]

(b) What is Laser interferometry? Explain working of Laser telemetric system. [8]

OR

Q.4 Describe the use of Laser in alignment tests on lathe, milling machine and pillar type drilling machine. [16]

UNIT-V

Q.5 (a) What are the direct and indirect methods of force measurement? Explain various types of load cells. [8]

(b) Explain the working of Bourdon tube type pressure gauge with a neat sketch. [8]

OR

Q.5 Explain following in brief - [4×4=16]

(a) Orifice meter

(b) Venturimeter

(a) Thermistors

(b) Pyrometers

5E6204

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5E6204

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME4A Quality Assurance and Reliability

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks Main: 26

Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. Data Tables 2. NIL

UNIT-I

Q.1 Discuss the following in detail: [4×4=16]

(a) Dimensions of quality

(b) History of quality

(c) Quality improvements

(d) Quality control

OR

Q.1 (a) What do you understand by probability distribution? [8]

(b) Construct an OC curve for the sampling plan where the lot size is 2000, the sample size is 50, and the acceptance number is 2. [8]

UNIT-II

Q.2 (a) Explain X-bar and R charts with suitable examples. [8]

(b) How patterns on control chart are analysed? [8]

OR

Q.2 (a) Discuss the seven major statistical quality control problem solving tools. [8]

(b) The thickness of the magnetic coating on audio tapes is an important characteristic. Random samples of size 4 are selected, and the thickness is measured using an optical instrument. Table-1 shows the standard deviation for 20 samples. The specifications are 38±14.5 microns. If a coating thickness is less than the specifications called for, the tape can be used for a different purpose by running it through another coating operation. Draw an S-chart with control limits. [8]

Table -1

Sample	1	2	3	4	5	6	7	8	9	10
Standard Deviation	4.6	3.7	5.2	4.3	4.4	3.9	5.0	6.1	4.1	5.8
Sample	11	12	13	14	15	16	17	18	19	20
Standard Deviation	5.3	3.5	4.7	5.6	5.0	4.1	5.6	4.8	4.7	5.4

UNIT-III

Q.3 (a) Discuss the process capability analysis using Histogram. [8]

(b) The number of non-conformities in carpets is determined for 20 samples, but the amount of carpet inspected for each sample various. Results of the inspection are shown in table-2. Construct a control chart for the number of nonconformities per $100m^2$. [8]

Table -1

Sample	1	2	3	4	5	6	7	8	9	10
Amount Inspected (m^2)	200	300	250	150	250	100	200	150	150	250
Number of Nonconformities	5	14	8	8	12	6	20	10	6	10
Sample	11	12	13	14	15	16	17	18	19	20
Amount Inspected (m^2)	300	250	200	250	100	200	200	100	300	200
Number of Nonconformities	9	16	12	10	6	8	5	5	14	8

OR

Q.3 Classify the control charts for fraction nonconforming. Explain them. [16]

UNIT-IV

Q.4 (a) Discuss quality rating and quality audit in detail. [8]

(b) What are the sampling methods? Explain in detail. [8]

OR

Q.4 (a) Discuss the sampling plans in detail. [8]

(b) Construct on AOQ curve for the sampling plan where the lot size is 2000, the sample size is 100, and the acceptance number is 3. [8]

UNIT-V

Q.5 (a) Explain maintainability and availability. Also explain Taguchi method. [8]

(b) Explain failure, its types and causes of failure. [8]

OR

Q.5 Discuss the following in detail: [4×4=16]

(a) Hazard rate

(b) Bath-tub curve

(c) MTTF

(d) Redundancy

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5E6207

B. Tech V Sem. (Main/Back) Exam. Nov-Dec. 2015
Mechanical Engineering
5ME6.2A Automobile Engineering

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks Main: 26
Min. Passing Marks Back: 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.

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) What are the loads coming on a chassis frame? With the help of line diagram, explain the frame construction, briefly. Enumerate the different types of chassis frames. [8]

(b) Describe briefly the constructional features and working of fluid coupling. [8]

OR

Q.1 (a) Describe the constructional features and working of a semi-centrifugal clutch with the help of neat sketch. [6+3=9]

(b) With the help of suitable sketches, explain the principle and working of hydraulic brakes. Mention the advantages of hydraulic brakes over mechanical brakes. [7]

UNIT-II

Q.2 (a) Draw a simple diagram to show the layout 5 forward 1 reverse speed gear box. Explain its working in detail. [9]

(b) What is the necessity of differential in an automobile? Discuss in detail, the construction and operation of differential. [2+5=7]

OR

Q.2 (a) Write short note on (**any two**) - [4+4=8]

(i) Overdrive

(ii) Front wheel drive

(iii) Hotchkiss and Torque tube drive

(b) Explain the synchronizer action in manual transmissions with the help of a neat sketch. Explain the purpose of inter-lock device used in manual transmission. [8]

UNIT-III

Q.3 (a) What are the functions of wheel in an automobile? Describe the types and constructional features of tyre, briefly. [3+4=7]

(b) Explain the following terms - [9]

(i) Over steering and under steering

(ii) Power steering

(iii) Caster and Camber

OR

Q.3 (a) What is the difference between sprung and unsprung weight. Describe the independent rear suspension system with neat sketch and explain how it affects ride quality? [7]

(b) Explain the constructional features and working of telescopic absorber. [9]

UNIT-IV

Q.4 (a) Describe briefly the constructional features of battery used in automobile, with the help of neat sketch. How a battery is tested and charged? [5+3=8]

(b) Describe briefly, the constructional features and working principle of starter motor in an automobile. [4+4=8]

OR

Q.4 (a) Explain the Battery Ignition system with the help of neat sketch. Compare its advantages and disadvantages with that of Magneto Ignition system. [6+4=10]

(b) With the help of neat sketch, explain the working of the electric horn. [6]

UNIT-V

Q.5 (a) List the common faults related to automotive air conditioning system. How these faults are diagnosed and rectified? [5+3=8]

(b) Explain the significance and features of Night Vision system and Global Positioning system. [3+5=8]

OR

Q.5 (a) Enumerate the different loads on automotive air conditioning system. Explain the working of various components of automotive air conditioning system. [8]

(b) List the various safety requirements of an automobile. Explain the functions of various safety devices incorporated in automobiles now days. [3+5=8]
