UNIVERSITY OF PUNE

[4363]-114

T. E. (Mechanical)

INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT

(2008 Course)

Total No. of Questions : 12 **[Total No. of Printed Pages :4]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

(1) Answer any three questions from Section I and three questions from Section II

*(2) Answers to the **two sections** should be written in **separate books**.*

(3) Neat diagram must be drawn wherever necessary.

(4) Black figures to the right indicate full marks.

(5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(6) Assume suitable data, if necessary.

SECTION-I

Q1.

a) What is meant by scientific management? Explain in brief various functions of management. [8]

b) Define material handling. Explain the role of material handling principles in improving the productivity of a firm. [8]

OR

Q2.

a) Explain the concept of managerial grid model for categorizing the leaders. [6]

b) Differentiate between product layout and process layout. [5]

c) Describe the factors to be considered while finalizing the plant location with suitable illustration. [5]

Q3.

a) The observed times and the performance ratings for the five elements are given. Compute the standard time, assuming rest and personal allowance 12% and contingency allowance as 3% of the basic time. [8]

Element:	1	2	3	4	5
Observed time (min)	0.25	0.6	0.5	0.15	0.12
Performance rating	85	80	90	85	80

b) Discuss the two handed process chart in industrial engineering. [4]
c) What are therbligs? Give any six therbligs with symbols. [4]

OR

Q4.

a) Define method study. Explain the procedure for method study. [8]
b) Describe in brief the different types of allowances used while determining Standard time. [4]
c) Explain with examples method study symbols for recording the facts. [4]

Q5.

a) What is Inventory? Explain various costs involved with Inventory. [6]
b) What is demand forecasting? Explain Moving Average Method for demand forecasting. [6]
c) Explain the importance of Production Planning and Control for a typical industry. [6]

OR

Q6.

a) A manufacturer has to supply his customers 6000 units of his product per year. Shortages are not permitted. Inventory carrying cost accounts Rs 1.2 per unit per annum. The set up cost per run is RS. 100. Find: [10]
1) Economic Order Quantity 2) optimum no. of orders per annum

3) Minimum annual inventory cost & 4) Optimum period of supply per optimum order.

b) Explain briefly ABC analysis used in Industries. [4]
c) Compare techniques CPM and PERT. [4]

SECTION-II

Q7.

a) Explain the impact of Technological Development on society and business, give proper examples. [6]
b) Explain the significance of technology and management. [6]

c) Discuss role of government in Technology development. [4]

OR

Q8.

a) Explain process technology and product technology. [8]
b) Discuss the process of Managing Research and Development activities with neat block diagram. [8]

Q9.

a) List the various methods of Technology Acquisition. Explain any two in detail. [8]
b) Explain in brief the following. [8]
   1) Growth cures.
   2) Technology Monitoring.

OR

Q10.

a) Explain in brief (Any Two) [10]
   1) Technology leadership and followership.
   2) Morphological Analysis
   3) Mission Flow diagram.
b) What do you mean by technology assessment? [6]

Q11.

a) Explain why there is need to integrate the business strategy and technology strategy. [6]
b) Explain the steps involved in formulating technology planning. [6]
c) Explain the concept of technology diffusion. [6]

OR

Q12. Write short notes on the following: (any three) [18]

1) S-Shaped curve of Technology Adoption.
2) Technology transfer and its categories.
3) Status of IPR Activities in India.
4) Foreign Direct Investment (FDI).

[Total No. of Questions: *12*] **[Total No. of Printed Pages:** *3*]

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[4363]-117

T. E. (*Mechanical***)(Automobile) Examination - 2013**

Metrology And Quality Control (2008 Course)

[Time: *3* **Hours]** **[Max. Marks: 100]**

Instructions:

1 *Answer any three questions from each section.*
2 *Answers to the* ***two sections*** *should be written in* ***separate answer-books***.
3 *Neat diagrams must be drawn wherever necessary.*
4 *Black figures to the right indicate full marks.*
5 *Assume suitable data, if necessary.*

SECTION -I

Q.1	A	Explain the different types errors in measurement.	6
	B	What is the difference between Alignment test & performance test? Explain with neat sketch any four such tests on a Lathe machine.	10

OR

Q.2	A	Describe with neat sketches of autocollimator & sine bar.	8
	B	Explain with sketch the principle and working of sigma comparator? State its advantages & limitations.	8
Q. 3	A	Design a plug gauge for checking hole 70H8 Use $\bar{z}=0.45\sqrt[3]{D}+0.001D$, IT 8=28i. Diameter steps 50-80mm.	8
	B	Different between primary & secondary texture.	4
	C	Explain application of optical flat to check surface contours with suitable examples.	6

OR

Q. 4	A	Describe with neat sketch Tomlinson surface Recorder.	6
	B	What are optical flat? How are patterns of fringes interpreted?	4
	C	A shaft of 35 ± 0.004mm is to be checked by means of GO-NOGO gauge Design the dimensions of the gauge required.	8
Q. 5	A	Show that the best wire size for measuring effective diameter of thread is given by $d=\left(\frac{P}{2}\right)\sec\left(\frac{\theta}{2}\right)$ where p = pitch of the thread, θ=Thread angle	6
	B	Sketch & describe the Parkinson's gear tester	4
	C	Write a short note on computer controlled co-ordinate measuring machine.	6

OR

Q. 6 A Describe use of Devid Brown tangent comparator for gear measurement calculate the dimension of the Base tangent length over 3 teeth with module of 2.5mm, 20^{O} Pressure angle & 30 teeth. 8

B Write short notes on (any two) 4×2
i) Lasers in metrology
ii) Floating carriage micrometer
iii) Constant chord method for gear tooth thickness

SECTION II

Q. 7 A What is cost of Quality? Explain different types of cost of quality. 6

B Explain Turan's Trilogy approach with diagram. 5

C Explain the concept of Quality circle & their structure, advantages & limitations. 5

OR

Q. 8 A Explain the seven Quality tools. 6

B Explain in detail Quality characteristics. 6

C Describe malcom national Quality awards. 4

Q. 9 A Explain Quality function Development & its benefits on TQM. 6

B Explain ISO 9000 Quality system standards. 5

C Describe the concept & uses of Kaizen & JIT 5

OR

Q. 10 Write short notes on 4×4
i) FMECA
ii) ISO 14000
iii) Quality Audit
iv) Quality Assurance

Q. 11 A Define following elements and show quality region on OC curve. 5
i) Producers risk iii) AOQ
ii) Consumer's risk iv) LTPD

B Following data shows values of sample mean $\overline{x}$ and range R for 10 samples of size 5 each. Calculate control limits for mean chart and rang chart determine whether the process is under control or not. 7

Sample No.	1	2	3	4	5	6	7	8	9	10
$\overline{x}$	31.8	34	30.8	35	33	33.8	35.8	34	33	33.8
R	4	2	5	5	19	4	14	7	9	5

Component specification limits 40.37 ± 0.1
Take $A_2 = 0.577$, $D_3 = 0$, $D_4 = 2.110$.

C Explain the following types of sampling 4
i) systematic sampling
ii) cluster sampling

OR

Q. 12 A Differentiate between single sampling, double sampling & multiple sampling plan. 6

B Table given below shows the number of defective founn in inspection of 10 lots of 100 items each. 6

2 Determine the control limit for P-chart and state whether the process is in control. 6

Lot No.	1	2	3	4	5	6	7	8	9	10
No. of defectives	6	3	1	4	3	0	5	5	2	3

C For the data calculate the sample size & AOQ for a single sampling plan. 4
i) Probability of acceptance for 0.4% defective in a lot is 0.558
ii) Lot size N = 20,000 units
iii) $np' = 1.5$
iv) Defective found in the sample are not to be replaced.

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T. E.(Mechanical)Examination - 2013

HEAT TRANSFER (302042)

(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :6]**

[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **three questions** from each section .*

*(2) Answers to the **two sections** should be written in **separate answer-books**.*

(3) Black figures to the right indicate full marks.

(4) Neat diagrams must be drawn wherever necessary.

(5) Use of electronics pocket calculator is allowed.

(6) Use of external data books is not allowed.

(7) Assume suitable data, if necessary.

SECTION I

UNIT-I

Q1 a) Explain in brief the analogy between heat flow and electricity with its significance. [4]

b) An immersion water heater of surface area $0.1m^2$ and rating 1 kW is designed to operate fully submerged in water. Estimate the surface temperature of the heater when the water is at 40°C and $h_{water} = 300W/m^2K$. If this heater is by mistake used in air at 40°C with $h_{air} = 9W/m^2$ [4]

K, what will be the surface temperature?

c) Derive a general three dimensional heat conduction equation in Cartesian coordinate system. Reduce it as 1) Poisson equation, 2)Fourier equation, 3) Laplace equation. [10]

OR

Q2 a) A brick wall (k=1.5W/mK) 0.20 m thickness separates hot combustion gases of a furnace from outside ambient air which is at 25°C. the outer surface temperature of brick wall is found to be 100°C. if natural convection heat transfer coefficient on the outside surface of brick wall is 25 $W/m^2 K$, ε =0.85, calculate inner surface temperature of brick wall. [8]

b) Explain the significance of i. Thermal Diffusivity, ii. Thermal Conductivity, iii. Overall heat transfer coefficient [6]

c) Explain different types of Insulating materials [4]

UNIT-II

Q3 a) Define Critical radius of insulation. Explain why an insulated small diameter wire has a higher current carrying capacity than an uninsulated one. [8]

b) A plane wall of thickness 0.1 m and k=25 W/mK, having uniform volumetric heat generation of 0.3 MW/m^3 is insulated on one side and is exposed to a fluid at 92°C. the convective heat transfer coefficient between the wall and the fluid is 500 $W/m^2 K$. Determine: i) the maximum temperature in the wall, ii) temperature at the surface exposed to the fluid, iii) draw the temperature profile [8]

OR

Q4 a) An electrical conductor of 10mm diameter insulated by PVC (k=0.18 [8]

W/mK) is located in air at 30° C having convective heat transfer coefficient of 7.8 W/m^2 K. if surface temperature of base conductor is 85°C, find i. Current carrying capacity of conductor when 2mm thick insulation is provided (take resistivity of conductor = 70 $\mu\Omega$ cm), ii. Critical insulation thickness, iii. Max. current carrying capacity, iv. % increase in current carrying capacity by providing critical insulation.

b) A steel pipe (k=50 W/mK) of 100 mm I.D and 110 mm O.D is to be covered with two layers of insulation each having thickness of 50 mm. The thermal conductivity of first insulation material is 0.06 W/mK and that of the second is 0.12 W/mK. Estimate heat loss per meter length of pipe when temperature of inside tube surface is 523 K and that of surface is 323 K. if order of insulation is reversed, calculate change in heat loss with all other conditions kept unchanged. Comment on results. [8]

UNIT-III

Q5 a) Pin fin are provided to increase the heat transfer rate from a hot surface. Which of the following arrangement will give higher heat transfer rate: i) 6 fins of 10 cm length or ii) 12 fins of 5 cm length Take k_{fin} = 200 W/m°C, h= 20W/m^2 °C, Cross section area of fin=2 cm^2 perimeter = 4cm, fin base temp=230 ° C, Surrounding air temp=30°C. For analysis, use fin with insulated tip condition. [6]

b) Explain difference between fin efficiency and fin effectiveness [4]

c) A mercury thermometer is being used for measuring temperature of a fluid which changes within a time period less than 3 seconds. State the suitability of this arrangement by assuming bulb of thermometer a sphere of 1mm diameter having k=10W/mK, $\propto$ =5x10^{-5} m^2/s, h=10 W/m^2K. find [6]

diameter of thermocouple junction used for the same purpose in same environment. $K_{thermocouple}$ =90 W/mK, $\propto_{thermocouple}$ =25x10^{-5} m^2/s.

OR

Q6 a) State assumptions made in lumped capacitance method. Using this method derive the following relation$(T-T_a)/(T_i - T_a) = e^{-(Bi\ Fo)}$ with usual notations. [8]

b) Fins are more effective, when provided on the surface for which film heat transfer coefficient is smaller. Explain. [4]

c) Explain difference between Biot number and Nusselt number [4]

Q7 a) Explain how electrical network can be applied to solve radiation heat transfer problems. [6]

b) Two large parallel planes 'A' and 'D' are maintained at temperature of 1500K and 600K respectively. Their emissivities are 0.9 and 0.4 respectively. Two radiation shields, 'B' with emissivity=0.5 and 'C' with emissivity=0.2 are inserted in between them, such that A, B, C and D are placed one after the other. Calculate. i. Heat transfer rate without radiation shield, ii. Heat transfer rate with radiation shield, iii. Temperature attained by planes 'B' and 'C'. [10]

OR

Q8 a) Write the statements and mathematical expressions of the following laws in radiation heat transfer. i. Planck's law, ii. Wien's law, iii. Kirchhoff's law, iv. Lambert's cosine rule. [8]

b) Define Radiosity and Irradiation. [4]

c) Determine the rate of heat loss by radiation from a steel tube of outside [4]

diameter 70 mm and 3m long at a temperature of 227°C if the tube is located within a square brick conduit of 0.3 m side and at 27°C. take $\in$ steel=0.79 and $\in$ brick=0.93

UNIT-V

Q9 a) Define Prandtl number and give its significance. Give its relation with Thermal boundary layer and velocity boundary layer. Also give its value for liquid metals, heavy oils, water and air. [10]

b) A hot plate 1mx0.5m at 130°C is kept vertically in still air at 20°C. find i. Heat Transfer coefficient, ii. initial rate of cooling the plate in °C/min. Assume 0.5 m side is vertical and heat transfer takes place from both the sides of the plate. Use: $Nu=0.59\ (GrPr)^{1/4}$ At 75°C, the properties of air are: ρ =1.07 kg/m^3, v=19.1x10^{-6} m^2/s. Cp=1007 J/kg K, k=0.029 W/mK, mass of plate=20 kg, specific Heat of plate=400 J/kg K [6]

OR

Q10 a) Draw neat diagrams to show directions of natural convection fluid flow (development of thermal boundary layers) when: [8]

i. Plate is kept vertical and surrounding fluid temperature is higher than plate

ii. cylinder is kept horizontal and surrounding fluid temperature is lower than cylinder

iii. Plate is horizontal and surrounding fluid temperature is lower than the plate

iv. cylinder is vertical and surrounding fluid temperature is lower than the cylinder

b) Air at 2 bar pressure and 200°C is heated as it flows at a velocity of [8]

10 m/s through a tube with diameter of 3 cm with constant heat flux maintained at the wall with wall temperature 20°C above air temperature along all length of tube. Calculate: i. Heat transfer per unit length of tube, ii. increase in bulk temperature of air over 4 m length of tube.

Properties of air at 200°C are Pr=0.681, μ =2.57 x 10^{-5} kg/ms, k= 0.0386 W/mK, Cp=1.025 kJ/kg K. Use: Nu=0.023 $(Re)^{0.8}$ $(Pr)^{0.8}$

UNIT-VI

Q11 a) Explain phenomenon of nucleate boiling. List the factors that affect nucleate boiling. [8]

b) Write a note on Forced Convection Boiling [6]

c) Write a note on Heat Transfer Augmentation Techniques [4]

OR

Q12 a) Establish expression for LMTD for counter flow heat exchanger with usual notations. [8]

b) In a tube type parallel flow heat exchanger hot water at 80°C is cooled to 65°C by cold water entering at 20°C and leaving at 35°C. what would be the exit temperature if the flow rate of water is doubled? [10]

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[4363-113]

T.E.(Mechanical / Automobile) Examination May 2013

Theory of Machines-II

(2008 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 7]**

Instructions:

(1)Answer 3 questions from section I and 3 questions from section II.

(2)Answer to the TWO sections should be written in separate answer books

(3)Neat diagrams must be drawn whenever necessary.

(4)Figures to the right indicate full marks.

(5)Use of logarithmic tables slide rule,Mollier charts,electronic pocket calculator and steam tables is allowed.

(6)Assume suitable data whenever necessary.

SECTION-I

Q.1 (a)Explain Friction in turning pair. (4)

(b)Derive an expression for frictional torque of a collar thrust bearing assuming uniform pressure & uniform wear theory. (6)

(c)A single plate clutch,effective on both sides,is required to transmit 25 KW at 3000 r.p.m..Determine the outer and inner radii of frictional surface if the coefficient of friction is 0.225,the ratio of radii is 1.25 and the maximum pressure is not to be exceed $0.1\times10^{6}N/m^{2}$ .Also determine the axial thrust to be provided by springs. Assume uniform wear theory. (8)

OR

Q.2 (a)Write s short note on Epicyclic train Dynamometer. (6)

(b)Explain Multiple clutch with the help of neat sketch. (4)

(c)A differential band brake,as shown in fig.01 has an angle of contact of 225^0 .The band has compressed woven lining and bears against a cast iron drum of 350 diameter. The brake is to sustain a torque of 350 N-m and the coefficient of friction between the band and the drum is 0.30,find the necessary force for clockwise rotation of the drum. (8)

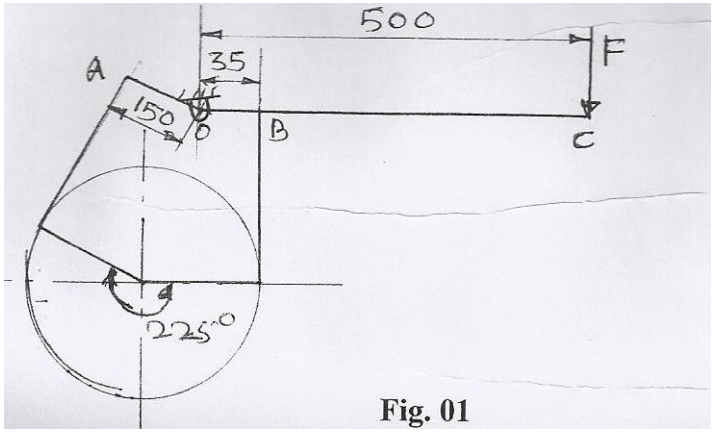


Fig. 01

Q.3 (a)Draw the profile of a cam ,offset 20mm to the right of the centre of the cam shaft.The base circle diameter is 75 mm and the diameter of the roller is 10mm.The follower is to move outward a distance 40mm with S.H.M. In 140^0 of the cam rotation to dwell for 40^0 of cam rotation to move inward with 150^0 of cam rotation with uniform acceleration and retardation ,acceleration being 2/3 of retardation.Calculate the maximum velocity and acceleration of the follower during outstroke if the camshaft rotates at 90 rpm. (16)

OR

Q.4 (a)Write a short note on cam jump phenomenon. (4)

(b)What do you mean by advanced can curves?Explain. (4)

(c)Derive expressions for displacement ,velocity and acceleration for circular arc cam operating a flat faced follower:(i)When the contact is on the circular flank. (8)

Q.5 (a)Write a short note on -(i)Hunting of governor and (ii)Governor effort & Governor power. (8)

(b)Derive from the first principles an expression of the gyroscopic couple. (8)

OR

Q.6 (a)A porter governor has all the four arms of 300 mm each. All the upper arms as well as the sleeve arms are pivoted on the axis of rotation. The mass of each governor ball is 1 Kg. The mass on sleeve is 20Kg find the speed of rotation when the ball rotates at a radius of 150mm. (8)

(b)A ship is pitching a total angle of 15^0 ,the oscillation may be taken as simple harmonic and the complete period is 32 seconds. The turbine rotor mass is 600Kg,its radius of gyration is 450mm and it is rotating at 2400 r.p.m.Calculate the maximum value of gyroscopic couple set by the rotor and its effect,when the bow is descending and the color is rotating clockwise looking from aft. What is the maximum angular acceleration to which the ship is subjected to while pitching? (8)

SECTION-II

Q.7 (a)Explain 'Conjugate action' in gearing. How involute profile satisfies the law of gearing? (8)

(b)Two 20^0 involute gears in mesh have a gear ratio of 2 and 20 teeth on the pinion. The module is 5mm and the pitch line speed is 1.5 m/s. assuming addendum to be equal to one module,find

(i)Angle turned by pinion when one pair of teeth is in mesh,and

(ii)Maximum velocity of sliding. (10)

OR

Q.8 (a)Explain the following term with reference to interference in the gears. (4)

(i)Rack shift (ii)Fouling

(b)Compare the cycloidal and involve gear tooth profile. (4)

(c)Following data relate to two meshing involute gears.

1.Number of teeth on the gear wheel=60

2.Pressure angle= 20^0

3.Gear ratio=1.5

4.Speed of the gear wheel=100rpm

5.Module=8mm

The addendum on each wheel is such that the path of approach and the path of recess on each side are 40 % of the maximum possible length each.Determine the addendum for the pioion and the gear and the length of arc of contact. (10)

Q.9 (a)A pair of single gear is required to give a speed reduction of 4:2:1.the gears are to have a normal module of 3mm, a pressure angle of 20^0 and a helix angle of 30^0 .If the shaft cetre lines are to be approximately 400mm apart ,determine the number of teeth on each wheel and exact centre distance.(8)

(b)Two spiral gears in mesh have the following data.

1.Angle of friction= 6^0

2.Normal pitch=20mm

3.Shaft angle= 55^0

4.Speed ratio=3

5.Approximate centre distance =400mm

6.Spiral angle of pinion= 25^0

Determine (i)exact centre distance (ii)number of teeth in each wheel, and (ii)efficiency of the drive. (8)

OR

Q.10 (a)A three start worm has pitch diameter of 80mm and a pitch of 20mm.It rotates at 600 rpm and drives a 40 tooth worm gear.If coefficient of friction is 0.05 , find

1.The helix angle of the worm

2.The speed of the gear

3.The centre distance

4.The efficiency and maximum efficiency. (10)

(b)Show various forces acting on the tooth of bevel gear. (6)

Q.11 (a)Explain the working principle of the following:(i)Reverted gears, (ii)Humpage gear. (6)

(b)The pitch circle diameter of annular gear in the epicyclic gear train shown in Fig.1 is 425 mm and the module is 5mm.When the annular gear 3 is stationary ,the spindle A makes one revolutions in the same sense as the sun gear 1 for every 6 revolutions of the driving spindle carrying the sun gear. All the planet gears are of the same size. Determine the number of teeth on all the gears. (10)

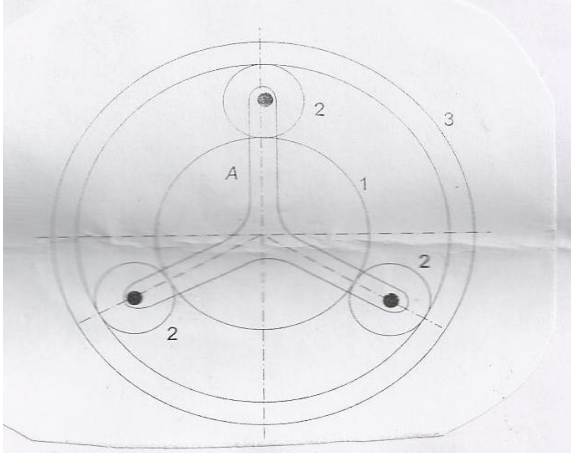


Fig. 1

OR

Q.12 In the gear drive shown in the fig 2.,the driving shaft A rotates at 300rpm in the clock wise direction,when seen from the left hand side. The shaft B is the driven shaft. The casing C is held stationary. The wheels E and H are keyed to the central vertical spindle and wheel F can rotate freely on this spindle. The wheels K and L are rigidly fixed to each other and rotate together freely on a pin fitted on the underside of F. The wheel L meshes with internal teeth on the casing C. The number of teeth on the different gears is indicated within the bracket.

Determine the number of teeth on gear C and speed and direction of rotation of shaft B. (16)

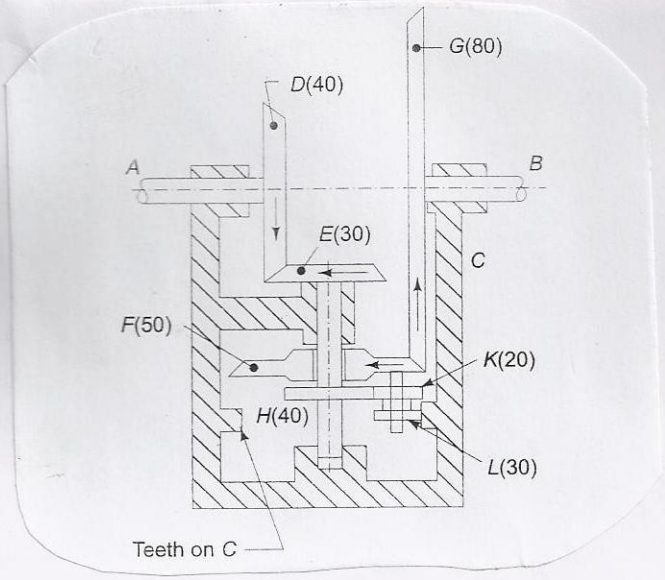


Fig.2

UNIVERSITY OF PUNE

[4363-115]

T.E.(Mechanical / Automobile Engineering)Examination,

April-May 2013

Computer Oriented Numerical Methods

(2008 pattern)

Time-Three hours **Maximum Marks-100**

[Total No. of Question=12] **[Total no. of printed pages= 5]**

Instructions:

(1)Answer three questions from Section-I and three questions from Section-II.

(2)Answers to the two sections should be written in separate answer books.

(3)Neat diagram must be drawn necessary.

(4)Figures to the right indicate full marks.

(5)Use electronic Pocket calculator is allowed.

(6)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a)Find a real root of $2x - \log_{10} x = 7$ correct to four decimal places using iteration method. (8)

(b)Draw a flowchart for Simpson's 3/8 rule of integration. (8)

OR

Q.2 (a)Draw a flowchart for modified Newton Raphson method. (6)

A circular shaft having 1 meter length has varying radius 'r' as follows.

X(m)	0	0.25	0.5	0.75	1
r(m)	1	0.9896	0.9589	0.9089	0.8415

(b)An axial pull of 300 KN is applied at one end of the shaft whose modulus of elasticity is $200*10^9 N/m^2$ .The axial elongation of the shaft （Δ） is given by ,

$\Delta x=(P/E)\int_0^1 (1/A)*dx$ .Where A is cross sectional area of shaft.Determine elongation of shaft over the entire length by Simpson'3 rule. (10)

Q.3 (a) Draw flowchart for Lagrange' Interpolation method. (6)

(b)Find polynomial passing through points (0,1)(1,1)(2,7)(3,25)(4,61)(5,121) using Newton's Interpolation formula and hence find y and dy/dx at x=0.5 (10)

OR

Q.4 (a)The values of x,y & y' are given below .Use Hermit Interpolation to find values of y at x=0.25. (10)

x	y	y'
0	0	0
1	1	1

(b)Find dy/dx & d^2y/dx^2 at 0.4 from the following given values of x & y. (6)

x	0.1	0.2	0.3	0.4	0.5
y	-2.3	-1.6	-1.2	-0.91	-0.69

Q.5 (a)From the table below for what value of x,y is minimum?Also find the value of y. (10)

x	3	4	5	6	7	8
y	0.205	0.2400	0.2590	0.2620	0.2500	0.2240

(b)Draw Flowchart for Lagrange's Interpolation. (8)

OR

Q.6 (a)Find the cubic polynomial which takes the following value. (10)

x	0	1	2	3
f(x)	1	2	1	10

Hence the otherwise evaluate f(4).

(b)Draw a flowchart for Newton's Forward Difference Method. (8)

SECTION -II

Q.7 (a)Draw a flowchart for logarithmic curve fitting. (8)

(b) In some determinations of the value v of carbon dioxide dissolved in a given volume of water at different temperatures θ ,the following pairs of values were obtained. (8)

θ	0	5	10	15
v	1.80	1.45	1.18	1.00

Obtain by the method of least square, a relation of the form $v=a+b\theta$ which best fits to these observations.

OR

Q.8 (a) The pressure and volume of a gas are related by the equation $pV^{\gamma}=k$,

γ and k being constants.Fit this equations for the following set of observations. (10)

$P(kg/cm^2)$	0.5	1	1.5	2	2.5	3
V(liters)	1.62	1	0.75	0.62	0.52	0.46

(b)Why least square error regression method is preferred over other methods of linear regression ?Also explain why squaring of error is carried out,if squaring of error is not done what will be effect on curve fitting equation. (6)

Q.9 (a)Using Runge-Kutta method of fourth order,solve $\frac{dy}{dx}=y^2-x^2/y^2+x^2$ with $y(0)=1$ at x=0.2,0.4. (10)

(b)Explain predictor and corrector method to solve ordinary differential equation and also draw corresponding flow chart. (6)

OR

Q.10 (a) The second order ODE is transformed into pair of first-order ODEs as in (10)

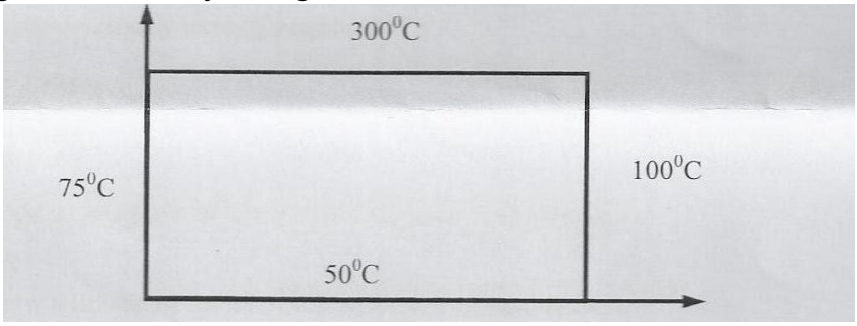
$$\frac{dy}{dt}=z \qquad y(0)=2$$

$$\frac{dz}{dt}=0.5\text{x}-y \qquad z(0)=0$$

Estimate the value of z and y at x=0.2 with step size of 0.1

(b)What is meant by order of Runge -Kutta method?And compare RK methods 2^{nd} order ,3^{rd} order and 4^{th} order graphically. (6)

Q.11 (a)Consider a plate $2.4\text{m} \times 3.0\,m$ that is subjected to the boundary conditions shown below.Find the temperature at the interior at the nodes using a square grid with a length of 0.6 m by using the direct method. (6)



(b)What is difference between implicit method and explicit method for better convergence and stability which is best suitable. (6)

OR

Q.12 (a) Consider a steel rod that is subjected to a temperature of 100^0 C on the left end and 25^0 C on the right end .If the rod is of length 0.5 m,use the implicit method to find the temperature distribution in the rod from t=0 and t=9seconds. Use $\Delta x = 0.01\text{m}$ and $\Delta t = 3\,sec$. (12)

(b)Draw a flow chart for Crank Nicholas method for solution of parabolic partial differential equation. (6)

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T. E. (Semester - I) Examination –2013
T.E [Automobile]2008Course
Machine Design- 316481

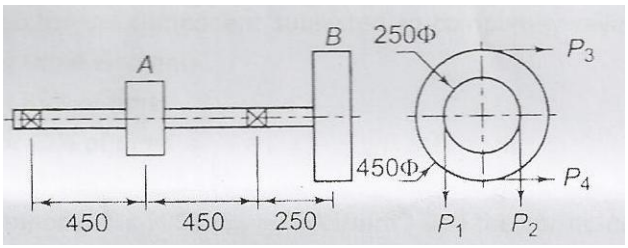
[Total No. of Questions:] **[Total No. Printed Pages: 4]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

1) *Answer **any three** questions from each I and three questions from section II*
2) *Answers to the **two sections** should be written in **separate answer-books**.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Black figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION -I

Q 1) A line shaft supporting two pulleys A and B is shown is Fig. Power is supplied to the shaft by means of a vertical belt on the pulley A, which is then transmitted to the pulley B carrying a horizontal belt. The ratio of belt tension on tight and loose sides is 3:1 The limiting value of tension in the belts is 2.7 kN. The shaft is made of plain carbon steel 40C8 (s_{ut}=650N/mm^2 and S_{yt} = 380N/mm^2). The pulley are keyed to the shaft. Determine the diameter of the shaft according to the ASME code if, k_b=1.5 and k_t=1.0 [18]



OR

Q.2) Design a cast iron flange coupling to connect two shafts of 45mm diameter to transmit 20kW power at 400rpm. The permissible shear strength for the shaft bolt and key is 50N/mm^2 and the permissible stress is 120N/mm^2. The permissible shear strength for cast iron is 15N/mm^2 Assume starting torque 30percent higher than the nominal torque. Design the coupling. [14]

b) Design a square key to transmit 5kW power at 1440rpm. The shaft diameter is 20mm. The key has yield strength 300N/mm^2. Assume a factor of safety as 3. [4]

Q3.a) The nominal diameter of a triple-threaded square screw is 50mm, while the pitch is 8mm. It is used with a collar having an outer diameter of 100mm and inner diameter as 65mm. the coefficient of friction at the thread surface as well as at the collar surface can be taken as 0.15 the screw is used to raise a load of 15kN. Using the uniform wear theory for collar [10]

friction, calculate :

i) Torque required to raise the load;

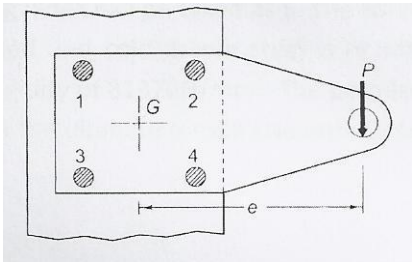
ii) Torque required to lower the load; and

iii) The force required to raise the load, if applied at a radius of 500mm.

b) What do you understand by the self locking screw? Explain the condition for self locking? [6]

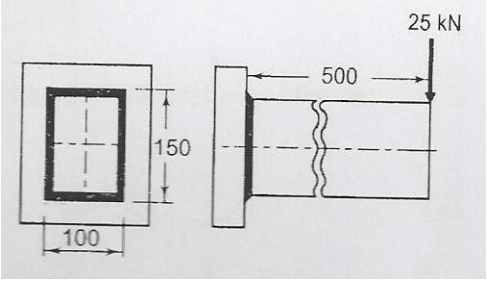
OR

Q.4 a) The structural connection shown in fig. below is subjected to an eccentric force P of 10kN with an eccentricity of 500mm from the CG of the bolts. The center distance between bolts 1 and 2 is 200mm and the center distance between 2 and 3 is 150mm. all the bolts are identical. The bolts are made from plain carbon steel 30C8 (S_{yt} = 400N/mm^2) and the factor of safety is 2.5 Determine the size of the bolts. [8]



b) A beam of rectangular cross section is welded to a support by means of fillet welds as shown in fig. blow. Determine the size of the belts, if the [8]

permissible shear in the weld is limited to 75N/mm^2.



Q.5) The work cycle of a mechanical component subjected to completely reversed bending stress consists of the following three elements [16]

i) $\pm 350 N/mm2 for\ 85\%\ of\ time$

ii) $\pm 400 N/mm2\ for\ 12\%\ of\ time$

iii) $\pm 500 N/mm2\ for\ 3\%\ of\ time$

The material for the component is 50C4 (S_{ut} = 660N/mm^2) and the corrected endurance limit of the component is 280N/mm2. Determine the life of the component.

OR

Q.6 a) Explain the modified Goodman diagram for bending stress and torsional shear stress. [8]

b) Define the term stress concentration. State the cause of stress concentration. Also suggest the methods to reduce it. [8]

SECTION -II

Q.7) A railway wagon moving a velocity of 1.5m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of the wagon is 1500kg. The spring are compressed by 150mm in bringing the wagon to rest. The spring index can be taken as 6. The springs are made up of oil hardened and tempered steel wire with ultimate tensile strength of 1250N/mm^2 and modulus of rigidity 81370N/mm^2. The permissible shear stress for the spring wire can be taken as 50% of the ultimate tensile strength. Design the spring and calculate [18]

i) Wire diameter
ii) Mean coil diameter
iii) Number of active coils
iv) Total number of coils
v) Solid length
vi) Free length
vii) Pitch of the coil
viii) Required spring rate
ix) Actual spring rate

OR

Q.8) A helical compression spring, made of circular wire, is subjected to an axial force, which varies from 2.5KN to 3.5KN. Over this range of force, the deflection of the spring should be approximately 5mm.The spring index can be taken as 5.The spring has square and ground ends. [18]

The spring is made of patented and cold drawn steel wire with ultimate tensile strength of 1050N/mm^2 and modulus of rigidity of 81370N/mm^2. The permissible shear stress for the spring wire should be taken as 50% if the ultimate tensile strength. Design the spring and calculate

i) Wire diameter
ii) Mean coil diameter
iii) Number of active coils
iv) Total number of coils
v) Solid length of the spring
vi) Free length of the spring
vii) Required spring rate and
viii) Actual spring rate

Q.9) The following data is given for a 360^0 hydrodynamic bearing: [16]

Radial load=3.2kN

Journal speed =1490 rpm

Journal diameter =50 mm

Bearing length = 50 mm

Radial clearance = 0.05mm

Viscosity of lubricant = 25 cP

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate

i) Coefficient of friction

ii) Power lost in friction

iii) Minimum oil film thickness

iv) Flow requirement in liters /min

v) Temperature rise

Table *Dimensionless performance parameters for full journal bearing with side flow*

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_o}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max.}}\right)$
1	0	1.0	∞	(85)	∞	π	0	–
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

OR

Q.10 a) A single-row deep groove ball bearing is subjected to a 30 second work cycle that consist of the following parts : [10]

	Part I	Part II
Duration (s)	10	20
Radial load (kN)	45	15
Axial load (kN)	12.5	6.25
Speed(rpm)	720	1440

The static and dynamic load capacities of the ball bearing are 50 and 68kN respectively. Calculate the expected life of the bearings in hours.

b) Draw and Explain the mechanism of pressure development in oil film of hydrodynamic lubrication. [6]

Q.11 a) A pair of spur gears with 20^0 full-depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40mm. the material for the pinion as well as for the the gear is steel with an ultimate tensile strength of 600N/mm^2 .The gears are heat- treated to a surface hardness o 400BHN. The pinion rotate at 1450 rpm and service factor for the application is 1.75. Assume that velocity factor accounts for the dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. [10]

Use following data

$Y = 0.484 - \frac{2.87}{z^1}$ $for\ 20°\ FDI\ teeth$

$Cv = \frac{5.6}{5.6+\sqrt{v}}$

$k = 0.16 \left(\frac{BHN}{100}\right)^2 N/mm^2$

b) What is the significance of formative of virtual number of teeth in the design of Helical gears. Derive an expression for same. [6]

OR

Q.12 a) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotate at 720rpm. The normal pressure angle is 20^0, While the helix angle is 25^0. The face width is 40 mm and the normal module is 4mm. the pinion as well as the gear is made up of steel 40C8 (s_{ut} = 600N/mm^2) and heat treated to the surface hardness of 300BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears. [12]

Use following data :

$$k = 0.16 \left(\frac{BHN}{100}\right)^2 \ N/mm^2$$

$$Cv = \frac{5.6}{5.6 + \sqrt{v}}$$

$$Y = 0.484 - \frac{2.87}{z^1} \text{ for } 20^0 \text{ FDI teeth}$$

b) What is dynamic load? What are its causes? [4]

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T. E.(Automobile)Examination - 2013
AUTOMOTIVE ENGINE DESIGN(316483)
(2008 Pattern)

[Total No. of Questions:12] **[Total No. of Printed Pages :6]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*(1) Answer **any three** questions from each section.*
*(2) Answers to the **two sections** should be written in **separate answer-books**.*
(3) Black figures to the right indicate full marks.
(4) Neat diagrams must be drawn wherever necessary.
(5) Use of non programmable calculator is allowed.
(6) Assume suitable data, if necessary.

SECTION-I

Q1 a) Derive an expression for efficiency of dual cycle. [6]

b) An oil engine works on the Dual cycle, the heat liberated at constant pressure being twice that liberated at constant volume. The compression ratio of the engine is 10 and the expansion ratio is 5.3. The compression and expansion process follow the law $pV^{1.3}=C$. The pressure and temperature at the beginning of compression are 1.12 bar and 27° C respectively. Assuming C_p =1.005 KJ/kg K and C_v=0.717 KJ/kg K for air, find the air standard efficiency and the mean effective pressure. [10]

OR

Q2 a) What are the assumptions made in air standard cycle analysis? Explain the effect of clearance volume on efficiency. [6]

b) A diesel engine operating on the air standard cycle has six cylinders of 100 mm bore and 120 mm stroke. The engine speed is 1800 r.p.m. At the beginning of compression the pressure and temperature of air are 1.03 bar and 25°C. If the clearance volume is $1/8^{th}$ of the stroke volume, calculate (i) the pressure and temperature at the salient point of the cycle (ii) the Compression ratio (iii) the efficiency of the cycle and (iv) the power output if the air is heated to 1500° C. Assume C_p and C_v of air to be 1.005 kJ/kg K and 0.717 kJ/kg K respectively. [10]

Q3 a) Explain in brief about selection of (i) Engine type (ii) Bore and stroke (iii) Number of cylinder. [8]

b) Discuss the criteria for selecting number of cylinders for any engine. Why is cylinder arrangement important and what are the factors affecting cylinder arrangement? [8]

OR

Q4 a) Write the classification of CI engine combustion chambers and explain any two in brief with swirl obtained in that, with suitable diagram. [8]

b) Discuss the properties of lubricating oil and types of lubricating system [8]

Q5 a) Describe the different types of radiator matrix commonly used. What are their relative advantages and disadvantages? [4]

b) Explain the process of design of water pump for I.C. Engine [4]

c) The following data were recorded in a test one hour duration on single [10]

cylinder oil engine working on 4-stroke cycle: bore diameter=300mm stroke length=450mm, fuel used=8.8kg, calorific value of fuel=41800 kJ/kg, average speed=200rpm, mean effective pressure =5.8bar, brake friction load=1860 N, quantity of cooling water=650kg, temperature rise=22°C, diameter of brake drum wheel=1.22m, calculate (i) mechanical efficiency (ii) brake thermal efficiency (iii) draw heat balance sheet on kW basis.

OR

Q6 a) Describe the types of cooling system and explain advantages and application of them. [8]

b) A four stroke cycle gasoline engine has six single acting cylinders of 8cm bore and 10cm stroke. The engine is coupled to a brake dynamometer having torque radius of 40cm at 3200 rpm. With all cylinders operating the net brake load is 350 N. The average net brake load produced at the same speed by the remaining 5 cylinders is 250 N. Estimate the indicated mean effective pressure of the engine with all cylinders operating, the fuel consumption is 0.33kg/min; calorific value of fuel is 43 MJ/kg, the cooling flow rate and temperature rise is 70kg/min and 10°C respectively. On the test, the engine is enclosed in a thermally and acoustically insulated box through which the output drive, water fuel, air and exhaust connections pass. Ventilation air blown up through the box at the rate of 15kg/min enter at 17° C and leaves at 62°C. Draw the heat balance sheet of the engine stating the [10]

items as a percentage of the heat input.

SECTION-II

Q7 a) The cylinder of a four stroke diesel engine has the following specifications: Brake power=7.5KW, speed=1400 rpm, indicated mean effective pressure=0.35 MPa, mechanical efficiency=80%, maximum gas pressure=3.5MPa. [16]

The cylinder liner and head are made of grey cast iron FG 260(S_{ut}=260 N/ mm^2 and μ=0.25).the studs are made of plain carbon steel 40 C8(S_{yt}=380N/mm^2) The factor of safety for all parts is 6. Calculate:

i) Bore and length of the cylinder liner

ii) Thickness of the cylinder liner

iii) Thickness of the cylinder head

iv) Size, number and pitch of studs.

Reboring allowance for I.C. engine cylinder is:

D	75	100	150	200	250	300	350	400	450	500
C	1.5	2.4	4.0	6.3	8.0	9.5	11.0	12.5	12.5	12.5

(Note: D & C are in mm)

OR

Q8 a) The following data is given for a four stroke diesel engine: [8]

Cylinder bore=250mm, length of stroke=300mm, speed=600rpm, indicated mep=0.6 MPa, mechanical efficiency=80%, maximum gas pressure=4MPa, fuel consumption=0.25 kg per BP per hour, higher calorific value of fuel= 44000 KJ/kg. Assume that 5% of the total heat developed in the cylinder is

transmitted by the piston. The piston is made of grey Cast iron FG 200 (S_{ut}=2000 N/mm^2 and k=46.6 W/m/°C) and the factor of safety is 5. The temperature difference between the center and the edge of the piston head is 220°C. Calculate:

i) Thickness of Piston head by strength consideration

ii) Thickness of Piston head by thermal consideration

iii) Number and thickness of piston ribs.

b) Design an exhaust valve for a horizontal diesel engine using the following data: Cylinder bore=150mm, length of stroke=275mm, engine speed=500 rpm, maximum gas pressure=3.5 MPa, seat angle=45°. [8]

Calculate: i) Diameter of the valve port ii) Diameter of the valve head iii) Thickness of the valve head iv) Diameter of the valve stem v) Maximum lift of the valve

Assume mean velocity of the gas=50m/s, constant k for steel valve as 0.42 and permissible bending stress σ_b as 50 N/mm^2

Q9 a) Explain: i) Cylinder leakage test ii) Ignition timing [8]

b) Explain the working procedure of mechanical fuel pump with neat sketch. [8]

OR

Q10 a) What is the purpose of cylinder power balance test? Explain the power balance test procedure. [8]

b) Explain working of exhaust gas CO and HC analyzer with neat sketch. [8]

Q11 Write short notes on

a) Dual fuel engine [6]

b) Wankel Engine [6]

c) Variable compression ratio(VCR) engine. [6]

OR

Q12 a) Write the advantages of Dual Twin Spark-ignition (DTS-i) over single spark ignition Engine. [6]

b) Explain Homogenous Charge Compression Ignition(HCCI). [6]

c) Explain Variable valve timing (VVT) with neat sketch. [6]

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T. E. (Auto), Examination – 2013
AUTOMOTIVE TRANSMISSION
(Course 2008)

[Total No. of Questions:12] **[Total No. Printed Pages:2]**
[Time : 3 Hours] **[Max. Marks : 100]**

Instructions :

*1) Answer **any three** questions from each I and three questions from section II*
2) *Answers to the **two sections** should be written in **separate answer-books**.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Black figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) Assume suitable data, if necessary.

SECTION – I

Q.1 a) Explain types of chassis with reference to power plant location. [8]

b) Sketch a chassis layout of Truck or Bus. Explain the function of each part. [8]

OR

Q.2 a) Explain with neat sketch Torque tube drive [8]

b) Explain the Clutch control system [8]

Q.3 a) Explain Centrifugal Clutch with neat sketch [8]

b) Explain the types of Clutches and its application. [8]

OR

Q.4 a) Explain principle and construction of Synchronizing unit [8]

b) What do you mean by Gear selector mechanism? Explain any one of it. [8]

Q.5 a) Explain performance characteristics of Gear box. [8]

b) Explain with neat Synchromesh gear box [10]

OR

Q.6 a) Differentiate between Torque tube drive and Hotchkiss drive. [8]

b) Explain with neat sketch overdrive [10]

SECTION – II

Q.7 a) Explain differential unit with neat sketch [8]

b) Explain different types of final drives [8]

OR

Q.8 a) What are the types of rear axle? Explain function of rear axle in brief [8]

b) Explain briefly, with neat sketches, [8]

i) Half floating rear axle

ii) Three quarter floating rear axle

Q.9 a) Compare Torque convertor with conventional gear box. Explain performance characteristics of Torque Convertor. [10]

b) Explain with neat sketch operating principle, construction and working of torque convertor. [8]

OR

Q.10 a) Explain construction and working of Wilson Epicyclic gear train. [8]

b) Write note on – Clutches and brakes in Epicyclic gear train [10]

Q.11 a) Compare Manual and Semi automatic transmission [8]

b) Explain with neat sketch construction and operating principle of Continuous Variable transmission (CVT). [8]

OR

Q.12 a) Differentiate between Hydramatic transmission and Continuous variable Transmission (CVT). [8]

b) Draw a layout of any one Transmission system and explain its function. [8]

[Total No. of Questions:6] **[Total No. of Printed Pages: *2*]**

UNIVERSITY OF PUNE

[4363]-134

T. E. (*AutomobileI*) Examination - 2013

(AUTOTRONICS)(316485)(2008 Course)

[Time: *3* Hours] **[Max. Marks: 100]**

Instructions:

1. *Answers to the **two sections** should be written in **separate answer-books**.*
2. *Draw neat diagrams wherever necessary.*
3. *Numbers to the right indicate **full marks.***
4. *Assume suitable data, if necessary.*
5. *Use of logarithmic tables, electronic pocket calculator is allowed.*

SECTION –I

Q.1	A	Explain transducer and its types	6
	B	Discuss Static characteristics & instruments used in automobiles	10
		OR	
Q.1	A	Discuss role of electronic component in measurement in automobiles and list few	10
	B	Discuss with application the piezoelectric transducer	6
Q. 2	A	Discuss air flow measurement device with diagram	6
	B	Explain Electromagnetic sensor	6
	C	Discuss working of throttle position sensor	6
		OR	
Q. 2	A	Explain measurement of exhaust gas elements measurements, with instrumentation	10
	B	List various temperature measurement sensors used in automotive systems and explain one in detail.	8
Q. 3		Explain the following**(Any two)(8 marks each)** a. D/A converter and A/D converter b. Application of PLC in Automotive engineering c. Components of power window system d. Uses of timer, relay and counters	16
Q. 4	A	Explain the following**(any three)(6 marks each)** a. Sequential injection technique b. Electronic ignition system	18

c. Engine control unit
d. Cold start engine system
e. Effect of spark timing control on engine performance
f. Fuel enrichment/cut off system for a typical engine

Q. 5	A	Explain with detail diagram electric power system	10
	B	Discuss working of Global positioning system	6
		OR	
Q. 5	A	Explain Supplementary restrain system of ABS	8
	B	Explain electronic control of suspension	8
Q. 6	A	Explain rollover mitigation system	8
	B	Explain electronic stability	8
		OR	
Q. 6	A	Essential features of vehicle safety	6
	B	Various systems employed for vehicle safety	6
	C	List the sensors employed for vehicle safety	4

[Total No. of Questions: 12] **[Total No. of Printed Pages:2]**

UNIVERSITY OF PUNE
[4363]-135
T. E. (Automobile) Examination - 2013
VEHICLE BODY ENGINEERING
(2008 Course)(316486)

[Time: 3 Hours] **[Max. Marks: 100]**

Instructions:

1 *Answers to the two sections should be written in separate answer-books.*
2 *Black figures to the right indicate full marks.*
3 *Neat diagrams must be drawn wherever necessary.*
4 *Assume suitable data, if necessary.*
5 *Answer any three questions from Section I and any three questions from Section II*

SECTION -I

Q.1	A	Write down several body optimization techniques to reduce aerodynamic drag.	8
	B	Car is moving with speed of 80Km/Hr. and having frontal area $3m^2$ at ambient atmospheric condition, find out aerodynamic drag and moments. (Take dimensional drag coefficient as 0.28 assume suitable data.)	8
		OR	
Q.2	A	Explain scale model testing with different types.	8
	B	Explain various type of force acting on vehicle while moving and explain moments occurs due of that.	8
Q. 3	A	Explain in brief 'safety design of car'.	8
	B	Write at short note on any 2of following. i. Front assembly ii. Roof assembly iii. Space in cars	2*4
		OR	
Q. 4	A	Explain driver visibility and methods of improving visibility with regulations.	8
	B	Write a short note on any 2 of following. i. Saloon car ii. Limousine car iii. Hatchback car	2*4
Q. 5	A	Prepare layout of bus having capacity of 35 seats and travel for 20Km	12

		for one run considering all necessary features. Consider bus is forward controlled engine and having single deck.	
	B	Write difference between city bus and long root bus.	6
		OR	
Q. 6	A	Prepare layout of bus having capacity of 45 seats and travel for 250Km for one run considering all necessary features. Consider bus is luxury and having luggage compartment.	12
	B	Write a short note on passenger comfort.	6

SECTION II

Q. 7	A	Explain in brief, a) Tipper body. b) Tanker body. c) Flat platform vehicle. d) Drop side and fixed side.	4*4
		OR	
Q. 8	A	Discuss light construction vehicle in brief.	7
	B	Draw and explain driver seat and controls for cars, HTV and LTV.	9
Q. 9	A	Write a short note on symmetric and asymmetric loading of vehicle.	8
	B	Explain idealized structure of vehicle body.	8
		OR	
Q. 10	A	Explain shear panel method of structural analysis.	8
	B	Write about analysis of but body under bending and torsion stress.	8
Q. 11	A	Write a short note on, a) Any 3 types of seats used in automobile. b) Any 3 types of seats belts. c) Any 2 energy absorbing systems.	3*6
		OR	
Q. 12	A	‘Airbag is supplementary restrain system.’ Prove the statement with correct reason.	8
	B	Write in brief about impact protection from steering column.	5
	C	Explain impact of human anthropometry on vehicle comfort.	5