

M

(Printed Pages 4)

(21214)

Roll No.

B.Tech. V Sem.

TU-102(N)

B.Tech. Examination, Dec. 2014

ME

Machine Design - I

BT-516 (N)

Time : Two Hours /

/Maximum Marks : 50

Note : (1) Design Data Hand Book is permitted.

(2) Any missing data can be assumed.

(3) Non programmable calculator is permitted.

(4) Attempt any five question.

1. (a) Explain the Importance of Aesthetic considerations in machine Design. 5

P.T.O.

- (b) What is Ergonomics? Explain the man-machine closed-loop system. 5
2. A hot rolled steel rod is to be subjected to a torsional load that will vary from -100Nm to $+400\text{ Nm}$. Determine the diameter of rod using a factor of safety of 1.75 for the material of the rod, take : 10
 $S_{ut} = 489 \text{ MN/M}^2$; $S_{yp} = 315 \text{ MN / M}^2$.
3. (a) What is the difference between endurance limit and fatigue strength of a material. 5
(b) What are the various types of varying stresses. 5
4. Design a double riveted Butt joint with two cover plates for the longitudinal seam of a boiler shell, 0.75m diameter, to carry a maximum steam pressure of 1.05 N/mm^2 , The allowable stresses are $f_t=35 \text{ N/mm}^2$, $F_s=28 \text{ N/mm}^2$. Assume the efficiency of the joint 75%. 10
5. A machinery shaft is to transmit 61.5 kw at a speed of 1150 rpm. with mild shock. The shaft is subjected to a maximum bending moment of 900 NM and axial thrust of 70 KN. The shaft is supported at intervals of 2.5 meters. what should be its diameter when designed according to code? 10
6. The standard cross-section for a flat key, which is fitted on a 50 mm diameter shaft, is $16 \times 10 \text{ mm}$. The key is transmitting 475 N-M torque from the shaft to the hub. The key is made of commercial steel ($SY_t = SY_c = 230 \text{ N/mm}^2$). Determine the length of the key, if the factor of safety is 3. 10

7. Write down the Design procedure of screw Jack and also Draw the Heat Sketch.
8. Design the springs for a mechanical slieve. The weight of the dropping and the material being shifted is 900 N, the height of drop is 12.5mm, No steps except the springs themselves are used, 8 springs are taking the full impact and each time the frame is lifted by the mechanism they open up to their free length the load may be assumed as distributed evenly among all eight springs, under the impact each spring is deflected by 47.5mm (approximately). The endurance limit for torsion is 340 N/mm^2 . Also take the factor of safety as 1.7, $C=0.8 \times 10^5 \text{ N/mm}^2$

10

TU-102112014

M

(Printed Pages 6)

(21214)

Roll No.

B.Tech.-V Sem.

TU-103(N)

B.Tech. Examination, Dec. 2014

MECHANICAL ENGG.

Theory of Machine-I

BT-517(N)

Time : Three Hours } /Maximum Marks : 100

Note: Attempt any **five** questions.

1. In a double acting vertical steam engine running at 360 rpm, cylinder diameter is 25 cm, stroke is 30cm, diameter of Piston rod is 3.75 cm and the length of the Connecting rod is 60cm. When the crank has moved 120° from TDC., the Pressure of steam at Cover end is $35 \times 10^4 \text{ N/m}^2$. And at crank end is $3 \times 10^4 \text{ N/m}^2$. If the mass of the reciprocating part is 45kg find: $1 \times 20 = 20$

P.T.O.

- (i) Piston effect
(ii) Turning moment on the crank shaft for the given tank position.
2. Calculate the brake power of an engine which is running at a constant speed of 300 rpm and carries a rope brake dynamometer. The dead weight on the engine and spring balance readings are 550N and 100N respectively. The diameter of flywheel and rope are 1.8m and 18.75 mm respectively. $1 \times 20 = 20$
3. (i) Explain the following terms of governer.
10
(a) Controlling force
(b) Sensitiveness
(c) Stability
(d) Hunting
(e) Isochronous
(ii) A porter governer has all the four arms of 30cm each. All the upper arms as well as the sleeve arms are pivoted on

the axis of rotation. The mass of each governer ball is 1kg. The mass of the sleeve is 20 kg. find the speed of rotation when the balls rotate at a radius of 15 cm. 10

4. The four masses m_1, m_2, m_3 and m_4 having their radius of rotation as 200mm, 250mm, 150mm, and 300mm are 200kg., 300 kg 240kg and 260 kg in magnitude respectively. The angles between the successive masses are $45^\circ, 75^\circ$ and 135° respectively. Find the position and magnitude of the balance mass required, if its radius of rotation is 200mm. $1 \times 2 = 20$
5. A Hartnell type spring Loaded governer rotates about vertical axis. The two rotating masses weight 1.2kg. each and moves at a radius of 12cm when the speed is 550rpm. At this speed the arms 10cm and 7.5cm ef-

- fective length are respectively, vertical and horizontal . The equilibrium speed is 575 rpm when the rotating masses are at their maximum radius of 14.4cm Determine. 20
- (i) The stiffness of the spring at 550 rpm.
(ii) The compression of the spring at 550 rpm and the radius at which the weights rotate when the equilibrium speed is 525 rpm.
6. In a reciprocating engine mechanism, at the instant when the crank makes an angle of 30 degrees with the line of stroke the piston and from the inner dead centre , the velocity of the piston is found to be 4 m/s. The length of the connecting rod is 1m and the crank radius is 300mm. Determine. 20
- (i) Angular speed of the crank in revolution/ minute
(ii) Angular velocity of the connecting rod.
- (iii) Acceleration of the piston.
7. Illustrate various types of damped vibrations in detail with equation, case studies and diagrams. 20
8. (i) Write short notes on 'D' Alembert's principle and explain the concept of two point mass dynamically equivalent system. 10
- (ii) A mass of 10kg. is raised by a rope wound around a drum of 300mm dia. The drum shaft and gear B as a unit has mass moment of inertia 0.01kgm^2 . MI of motor shaft and gear A is 0.05kgm^2 . The speed reduction between motor and drum is 10:1. Determine the torque exerted by motor is order to move the mass upwards with an acceleration of 3m/s^2 . 10
9. With a neat sketch explain all the inversions of single slider crank kinematic chain. 20

TU-103(N)\120\4

TU-103(N)\120\5

P.T.O.

10. A vertical engine running at 1200 rpm with a stroke of 120mm has connecting rod of 300mm long, 1.5kg. mass. The mass centre of the connecting rod is 100mm from the big end centre. When the rod is suspended from the gudgeon pin centre as a pendulum, it makes 20 complete oscillations in 20 seconds. Determine the following: 20
- (a) Radius of gyration of the rod about an axis through the mass centre.
 - (b) Torque on the crank shaft due to the inertia of connecting rod when the crank is 35° from the top dead centre.

M

(Printed Pages 4)

(21214)

Roll No.

B.Tech. V Sem.

TU-104(N)

B.Tech. Examination, Dec. 2014

M.E.

Manufacturing Science - II

BT-518(N)

Time : Three Hours / Maximum Marks : 100

- Note: (i) Attempt any **five** questions.
(ii) All questions carry equal marks.
(iii) Use of calculator is permitted.

1. Explain the soldering and brazing operations. How both the operations are different from welding. (10)
2. Explain the metallurgy involved in welding. (10)
3. (a) What is Machinability? Explain the factors that affect the machinability of materials. 5
(b) Derive the Merchant Shear angle

P.T.O.

- relationship $2\phi + \beta - \alpha = \frac{\pi}{2}$ where 2ϕ =shear angle, β = friction angle, α = rake angle.
- 5
4. Explain the function of electrolyte in ECM. Also list the requirement of tool material for ECM. 10
5. (a) Describe Submerged Arc Welding with the help of a suitable diagram. Give advantages and limitations also. 5
- (b) Compare electro slag welding process with that of submerged arc welding. 5
6. While machining a 20mm diameter thin pipe on a lathe, the length of chip for 1 revolution of pipe was measured & found to be 40mm long tool had a rake angle of 10° . Determine Shear Angle. 10
7. (a) Write a short note on 'wear' of tools? what are the locations where wear usually occurs. 5
- (b) Describe the mechanics of chip formations. Derive an expression for shear strain in a chip assuming orthogonal cutting. 5
8. (a) What are the common abrasives used in a grinding wheel? which abrasives are recommended for grinding (i) Medium Carbon steel (ii) Brass. 5
- (b) State & Explain Taylor's principles of gauge design. 5
9. (a) What are functions of electrode coating? 5
- (b) Describe the essential difference between left ward & right ward gas welding technique. 5

10. Describe any **five**:

$$2 \times 5 = 10$$

- (i) Machine Tool
- (ii) Tool Life
- (iii) Important parts of lathe
- (iv) Various work holding device
- (v) Indexing
- (vi) Functions of flex
- (vii) Advantages of unconventional machining over conventional machining

TU-104(N)|120|4

M

(Printed Pages 6)

(21214)

Roll No.

B.Tech.-V Sem.

TU-105(N)

B. Tech. Examination, Dec. 2014

(M.E.Branch)

Heat and Mass Transfer

[BT-519(N)]

Time : Three Hours] [Maximum Marks : 100

Note : (i) Attempt any **five** questions.

(ii) **All** questions carry equal marks.

(iii) Use of calculator is permitted

1. (i) What do you understand by heat transfer? Discuss the modes of heat transfer in detail, also define thermal conductance and thermal resistance. 10
- (ii) A large composite wall is built of the following materials : 7.6 cm marble ($K=1.28 \text{ w/mK}$), 7.6 cm brick ($K=0.64$

P.T.O.

w/mK), 2.5cm pine ($K=0.1$ w/mK). The outside unit surface conductance is 35 w/m²K and temperature is 20°C, and the inside unit surface conductance 10 w/m²K and temperature is 35°C. Find heat loss through the wall.

2. (i) What do understand by critical thickness of insulation on cylinder? Also prove that

$$\text{Critical radius} = \frac{k \text{ (thermal conductivity)}}{h \text{ (heat transfer coefficient)}}$$

10

- (ii) What are the role of fins in Heat transfer. Prove that the total heat transfer by fin which is very long, and temperature at the fin tip approaches that of the surrounding fluid.

10

$$Q_{\text{Fin}} = \sqrt{hPKA_c} (T_0 - T_\infty)$$

Where h = Heat transfer coefficient,
 P = Perimeter, K = conductivity, A_c = Cross

TU-105(N)\120\2

Section Area, T_0 = Source temperature,
 T_∞ = Surrounding temperature.

3. (i) A long rod of 6.5mm in diameter is exposed to an environment at 27°C, the base temperature of the rod is 150°C. The heat transfer coefficient between the rod and environment is 30w/m²k. Calculate the heat loss by the rod. 10

- (ii) Write the short notes on : 10

- (a) Laminar flow
 (b) Turbulent flow

4. (i) Define Nusselt and Prandtl number. 10
 (ii) A Steel cylinder 20cm diameter is initially heated at 980°C, it is then quenched in an oil at 38°C with convection coefficient of 568 w/m²k. Calculate the time required for the cylinder centre to reach a temperature of 260°C. The property

TU-105(N)\120\3

P.T.O.

of steel are :

$$k = 16 \text{ W/mK}, s = 7816 \text{ kg/m}^3,$$

$$c = 460 \text{ J/kg}, \alpha = 4.4 \times 10^{-6} \text{ m}^2/\text{s}$$

10

5. Write the short notes on : 20

- (i) Absorptivity
- (ii) Reflectivity
- (iii) Transmissivity
- (iv) Emissivity

6. Two parallel, infinite gray surface are maintained at temperature of 127°C and 227°C respectively, if the temperature of hot surface is increased to 327°C . By what factor is the net radiation exchange per unit area increased? Assume the emissivity of cooler and hotter surface to be 0.9 and 0.7 respectively. 20

7. (i) Define Lambert's cosine law of radiation and prove that intensity of radiation is always constant at any angle of

TU-105(N)\120\4

emission for a diffused surface.

10

- (ii) What is the radiation shape factor between the inside surface of one hemisphere and that of another, both form a spherical enclosure? What is F_{1-1} ? 10

8. (i) What is the use of heat exchanger? Explain the classification of heat Exchanger.

10

- (ii) Find the surface area required in a counter flow steam superheater in which the steam enters at 180°C in a dry saturated state and leaves at 250°C with an increase of enthalpy of 159 KJ/Kg. The hot combustion gases ($C_p = 1.05 \text{ kJ/KgK}$) enters the superheater at 510°C the steam flow rate is 1000 kg/hr, the hot gases flow rate is 2000 kg/hr and the overall heat transfer coeffi-

TU-105(N)\120\5

P.T.O.

- cient is $26 \text{ w/m}^2\text{k}$. 10
9. (i) Derive an expression for LMTD of parallel flow heat Exchanger. 10
- (ii) Discusses the mode of Pool Boiling in Brief. 10
10. Write short notes on : 4×5
- (i) NTU
 - (ii) LMTD
 - (iii) Condensation
 - (iv) Fick's law of diffusion

TU-105(N)\12016