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10AL51

Fifth Semester B.E. Degree Examination, June/July 2019
Management and Entrepreneurship

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define term 'Management'? Explain its functions. **(05 Marks)**
b. List various contributions made by F.W. Taylor in the field of scientific management. **(05 Marks)**
c. List and explain "Roles of Manger"? **(10 Marks)**

2 a. List importance and purpose of planning process. **(05 Marks)**
b. Distinguish between strategic planning and tactical planning. **(05 Marks)**
c. Explain various steps involved in planning. **(10 Marks)**

3 a. What is 'Span of Management'? Explain various factors governing it. **(10 Marks)**
b. List and explain various principles of organization. **(10 Marks)**

4 a. What is meant by 'co-ordination', and explain requirements for excellent co-ordination. **(10 Marks)**
b. Explain by listing 'essentials of effective control system'. **(10 Marks)**

PART – B

5 a. List and explain various characteristics of an Entrepreneur. **(10 Marks)**
b. What are the roles of an entrepreneur in Economic development? **(10 Marks)**

6 a. Explain various steps involved in starting a 'small scale industry'. **(10 Marks)**
b. Explain how Govt. of India supported SSI through its five year plan. **(10 Marks)**

7 a. Under what context DIC's were established and what are the assistances it extends to SSI's. **(10 Marks)**
b. How TECSOK assist to start up and existing units and what assignment it undertakes. **(10 Marks)**

8 a. What is project Report and its significance? **(05 Marks)**
b. List Technical Analysis in project feasibility study. **(05 Marks)**
c. On what factors a project report to start an SSI is prepared, briefly explain. **(10 Marks)**

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10ME52

Fifth Semester B.E. Degree Examination, June/July 2019
Design of Machine Elements – I

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use machine design data hand book permitted.***
3. ***Missing data may be suitably assumed.***

PART – A

1 a. What is Mechanical Engineering Design? Explain. **(04 Marks)**

b. Explain the importance of standards in design. List different types of standards in use. **(04 Marks)**

c. A machine member made of a steel bar of 50 mm dia. is as shown in Fig. Q1 (c). It is subjected to a vertical load of 4 kN as shown. Indicate the critical point and determine principal stresses at the critical point. **(12 Marks)**

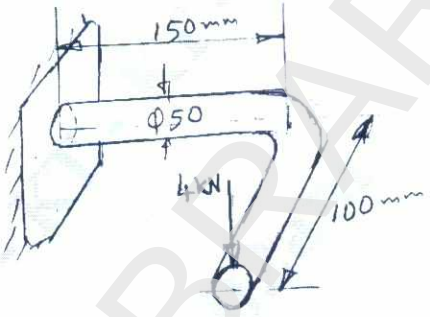

Fig. Q1 (c)

2 a. State and explain following theories of failure:
(i) Maximum normal stress theory.
(ii) Maximum shearing stress theory. **(04 Marks)**

b. A round rod made of steel C30 is subjected to bending moment of 2 kN-m and a twisting moment of 1.5 kN-m. Factor of safety is 2.5. Determine the diameter of the rod according to:
(i) Max. shear stress theory of failure and
(ii) Max. distortion energy theory of failure. . **(08 Marks)**

c. A mass of 15 kg falls from a height of 250 mm at the midpoint of a simply supported beam. It is made of steel, has a length of 1 m between the supports. Cross section of the beam is 60mm × 60mm square. Determine maximum deflection and bending stress induced in the beam due to falling mass. **(08 Marks)**

3 a. Explain :
(i) Stress concentration factor and methods to reduce effect of stress concentration.
(ii) Low cycle and high cycle fatigue.
(iii) Size and surface finish factors in fatigue design. **(06 Marks)**

b. A pulley is keyed to a shaft midway between two bearings. The shaft is made of C40 steel. At the mid section bending moment varies from −300 N-m to +500 N-m and the torque varies from −100 N-m to +200 N-m. The stress concentration factors for the key way for bending and torsion are 1.6 and 1.3 respectively. The notch sensitivity factor may be taken as 0.70 factor of safety is 1.5. Determine the diameter of the shaft. **(14 Marks)**

4 a. What are the advantages and disadvantages of threaded fastners? **(03 Marks)**

b. Obtain an expression for total load on a bolt in a bolted joint with gasket. **(05 Marks)**

c. A cylinder head is fastened to the cylinder of a compressor using 6 bolts of M20 size. Bolt material is C20 steel. The maximum pressure of the fluid is 3.5 MPa, cylinder dia is 75 mm. A soft gasket is used. Assuming initial tension required in each bolt is 70 kN, determine the factor of safety. Take $\sigma_{en} = 220$ MPa. **(12 Marks)**

PART – B

5 a. Explain advantages of hollow shafts over solid shafts. **(02 Marks)**

b. A power transmission shaft 1.3 m long is supported in bearings at its extreme ends A and B. A power of 30 kW is received at 500 rpm through a gear drive located at 400 mm to the right of the left extreme end of the shaft. PCD of the gear is 300 mm, pressure angle 20° and weighs 800 N. This gear receives power from a gear located exactly behind. When viewed from left the shaft is rotating in CCW direction. The power is delivered through a belt drive located 500 mm to the left of the right bearing. The pulley mounted on the shaft has a dia. of 400 mm and weighs 1 kN. The belt is directed towards the observer below the horizontal and inclined at 45°. Shaft is made of C40 steel. FOS is 2.5 and loading is with minor shock. Design the solid shaft. **(18 Marks)**

6 a. A mild steel shaft has to transmit 40 kW at 600 rpm. The maximum torque to be transmitted is 30% greater than the average torque. Design a rigid flanged coupling for this application. **(10 Marks)**

b. Design a knuckle joint to connect two mild steel rods. The joint has to transmit a tensile load of 80 kN. Allowable stresses for the material may be taken as $\sigma_t = 80$ MPa, $\sigma_{Cr} = 120$ MPa, $\tau = 40$ MPa. **(10 Marks)**

7 a. Design a diamond lap joint for a mild steel flat tie-bar 200mm × 10mm using 24 mm dia rivets. Take rivet hole dia as equal to the dia of the rivet. Allowable stresses are: $\sigma_t = 120$ MPa, $\tau = 80$ MPa, $\sigma_c = 200$ MPa. **(10 Marks)**

b. Determine the size of the fillet weld required for the flat plate loaded as shown in Fig. Q7 (b). Allowable stress for the weld material is 60 MPa. **(10 Marks)**

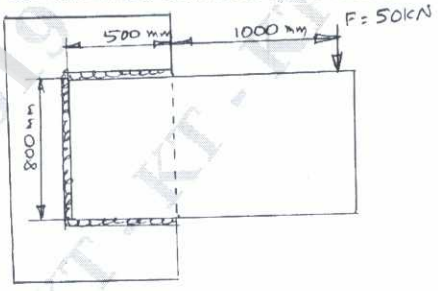

Fig. Q7 (b)

8 a. Derive an expression for torque required for raising the load in the case of a power screw. **(04 Marks)**

b. An automobile screw jack has to lift a load of 50 kN through a height of 150 mm. The screw is made of C30 steel. Nut is made of phosphor bronze for which allowable stresses may be : $\sigma_t = 30$ MPa, $\tau_{all} = 25$ MPa, $\sigma_{Cr} = 60$ MPa, bearing pressure = 14 MPa.

Design : (i) Screw (ii) Screw head and lever (iii) Nut.

Also check the screw for stresses induced. **(16 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, June/July 2019

Energy Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is meant by 'overfeed' and 'under feed' principles of firing of coal? **(02 Marks)**

b. Explain the working principle of over feed stoker of coal with neat sketch. **(07 Marks)**

c. What are the salient features of 'chain grate stoker'? **(06 Marks)**

d. Name the different type of pulverised coal burners and describe working of tangential coal burner. **(05 Marks)**

2 a. What are functions of a boiler? Explain the working principle of 'Benson' boiler with neat figure and state the important features of this boiler. **(08 Marks)**

b. What are the functions of boiler mountings and accessories? **(02 Marks)**

c. State the functions of the 'chimney' and determine the height of the chimney by using the following data :
15 kg of air supplied in the combustion chamber of a boiler using 600 kg/hr. Temperature of flue gases and ambient are 237°C and 32°C respectively. If the minimum draught required is 9.5 mm of water. **(10 Marks)**

3 a. State the field application of diesel engine power plant. **(05 Marks)**

b. State the importance of lubricating and cooling systems in diesel engine power plant. **(05 Marks)**

c. Describe the working of wet sump lubrication system. **(05 Marks)**

d. What are the different methods used for starting of diesel engine of power plant and explain the electric starting method. **(05 Marks)**

4 a. Define the following terms: (i) Hydrograph (ii) Mass curve (iii) Flow-duration curve and state the importance each. **(06 Marks)**

b. Run-off data of a river at a particular site for twelve months is tabulated below. Determine the power developed in MW, if the head available is 80 m, the whole water is utilized and the overall efficiency of the power generation is 85%. Assume each month of 30 days.
Runoff data table:

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Runoff (Mm^3) per month	40	25	20	10	0	50	75	100	110	60	50	40

Note: Mm^3 – Millions of meter cube. **(07 Marks)**

c. Explain the working principle of pumped storage plant (hydroelectric). **(07 Marks)**

PART – B

5 a. What are the isotopes? What is meant by radioactive decay? **(05 Marks)**

b. Describe the nuclear fission process. **(05 Marks)**

c. Name the important components of nuclear reactor and state the functions of each. **(05 Marks)**

d. Explain briefly the working principle of liquid metal cooled reactor with neat sketch. **(05 Marks)**

6 a. Define the terms, global radiation, beam radiation and sunshine hours and name the instruments used to measure solar radiations and sunshine hours. **(04 Marks)**

b. Explain the working of photo voltaic cell with neat sketch. **(06 Marks)**

c. For horizontal axis 'wind turbine' show that the available wind power, $P_a = \frac{1}{8}\pi D^2 V^3 \rho$.

Discuss the factors which are influencing on wind power where D = diameter of rotor, V = velocity, ρ = density of the air. **(05 Marks)**

d. State the functions of the following components of horizontal axis wind turbine:

i) Blade ii) Rotor
iii) Yaw drive iv) Pitch
v) Low speed and high speed shafts vi) Generator
vii) Nacelle viii) Hub **(05 Marks)**

7 a. Define the terms Tidal Range and tidal energy and explain the working of single basin and single effect tidal scheme power plant. **(08 Marks)**

b. Mention the important machines developed to harness the wave energy and describe the working of Heaving float type machine. **(06 Marks)**

c. What is meant by ocean thermal energy? Mention the salient features of closed cycle ocean thermal energy conversion plant (Anderson cycle). **(06 Marks)**

8 a. What is meant by anaerobic digestion? State the components of floating drum (KVIC) type biogas plant and state the function of each. **(08 Marks)**

b. What are the objectives of energy plantation? Mention any five species recommended for plantation. **(04 Marks)**

c. What is a producer gas? Describe the working of updraft gasifier with neat figure. **(08 Marks)**

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10ME54

Fifth Semester B.E. Degree Examination, June/July 2019
Dynamics of Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the equilibrium of the following systems: (i) Two force members (ii) Three force members (iii) Member with two forces and a torque. **(09 Marks)**

b. With usual notations, explain the principle of virtual work, considering a slider crank mechanism. **(11 Marks)**

2 a. Define the terms co-efficient of fluctuation of speed and co-efficient of fluctuation of energy. **(04 Marks)**

b. The turning moment curve for an engine is represented by the equation, $T = (20{,}000 + 9500\sin 2\theta - 5700\cos 2\theta)$ N-m, where θ is the angle moved by the crank from inner dead centre. If the resisting torque is constant, Find,

(i) Power developed by the engine.

(ii) Moment of inertia of flywheel in kg-m^2, if the total fluctuation of speed is not to exceed 1% of mean speed which is 180 rpm.

(iii) Angular acceleration of the flywheel when the crank has turned through 45° from inner dead centre. **(16 Marks)**

3 a. Derive an expression of total frictional torque for a flat collar bearing subjected to uniform pressure. **(08 Marks)**

b. A leather belt is required to transmit 7.5 KU from a pulley 1.2 m in diameter, running at 250 rpm. The angle of constant is 165° and coefficient of friction between the belt and pully is 0.3. If the safe working stress for the leather belt is 1.5 MPa and density of leather is 1000 kg/m^3 and thickness of belt is 10 mm. Determine the width of belt taking centrifugal tension into account. **(12 Marks)**

4 a. Explain the static and dynamic balancing. **(04 Marks)**

b. A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the masses of B, C and D are 10 kg, 5 kg and 4 kg respectively. Find the required mass 'A' and the relative angular settings of the four masses so that the shaft shall be in complete balance. **(16 Marks)**

PART – B

5 a. What is Hammer blow? Write an equation for maximum magnitude of Hammer blow. **(05 Marks)**

b. The three cranks of a three cylinder locomotive are all on the same axle and are set at 120°. The pitch of cylinders is 1 m and the stroke of each piston is 0.6 m. The reciprocating masses are 300 kg for inside cylinder and 260 kg for outside cylinder and the planes of rotation of the balance masses are 0.8 m. From the inside cranks. If 40% of the reciprocating parts are to be balanced. Find

(i) The magnitude and position of the balancing masses required at a radius of 0.6 m.t.

(ii) Hammer blow per wheel when the axle make 6 rps. **(15 Marks)**

6 a. Define the following:
(i) Sensitiveness (ii) Hunting (iii) Governor power (iv) Stability
(v) Isochronous governor. **(10 Marks)**

b. A porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the maximum and minimum speeds and range of speed of governor. **(10 Marks)**

7 a. Derive an expression for the gyroscopic couple. **(05 Marks)**

b. A rear engine automobile is travelling along a track of 100 mts mean radius. Each of four road wheels has a moment of inertia of 2.5 kg-m^2 and effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2. The engine axis is parallel to the rear axle and crank shaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5 m above road level, the width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with road surface. Assume that road surface is not cambered and centre of gravity of automobile lies centrally with respect to the four wheels. **(15 Marks)**

8 A symmetrical circular cam operating a flat faced follower has the following particulars:
Minimum radius of the cam = 30 mm,
Total lift = 20 mm,
Angle of lift = 75°,
Nose radius = 5 mm,
Speed = 600 rpm
Determine
(i) The principal dimensions of the cam
(ii) The acceleration of the follower at the beginning of the lift, at the end of contact with circular flank, at the beginning of contact with nose and at the apex of nose. **(20 Marks)**

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10ME55

Fifth Semester B.E. Degree Examination, June/July 2019
Manufacturing Process – III

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. With heat sketches, explain the classification of metal working process on the basis of force applied. **(10 Marks)**

b. Explain the concept of true stress and true strain. **(05 Marks)**

c. Write a note on determination of flow stress. **(05 Marks)**

2 a. Explain with a neat sketch, the Hydrostatic pressure in metal working. **(05 Marks)**

b. Discuss the concept of deformation – zone geometry, in metal working. **(05 Marks)**

c. Explain the effect of the following on metal working processes:
i) Temperature
ii) Strain rate
iii) Friction and lubrication. **(10 Marks)**

3 a. Using neat sketch, describes the various types of forging processes/operations. **(08 Marks)**

b. Derive an expression for forging pressure and load acting in plane strain considering coulombs friction at the interface. **(08 Marks)**

c. List and explain various types of forging defects. **(04 Marks)**

4 a. Sketch and explain the different types of rolling mills. **(08 Marks)**

b. Describe the effect of front and back tension on the rolling load. **(06 Marks)**

c. A 300mm wide aluminum alloy strip is hot rolled in thickness from 20 to 15mm. The rolls are 1m diameter and operate at 100rpm. The rolling load is 2.36MN. Find the power required for this hot reduction. **(06 Marks)**

PART – B

5 a. Using a neat sketch, briefly explain the different features of a drawing – die. **(08 Marks)**

b. Explain optimal cone angle and dead zone formation in drawing. **(04 Marks)**

c. Explain with neat sketches, different methods of tube drawing. **(08 Marks)**

6 a. Define extrusion using neat sketches. Explain the different methods of extrusion. **(08 Marks)**

b. Sketch and explain extrusion of seam less tubes. **(08 Marks)**

c. List any four defects in extrusion and explain anyone. **(04 Marks)**

7 a. Give the classification of dies in sheet metal forming and explain combination dies with neat sketch. **(08 Marks)**

b. Explain with sketch the following operations in sheet metal forming:
i) Cold extrusion
ii) Impact extrusion
iii) Hydrostatic extrusion. **(12 Marks)**

8 a. Discuss the principle of 'High Energy Rate Forming' methods and with a sketch explain explosive forming. **(10 Marks)**

b. With a flow chart, explain in detail the powder metallurgy process. **(10 Marks)**

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10ME56

Fifth Semester B.E. Degree Examination, June/July 2019

Turbomachines

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Write a descriptive note on the classification of turbo machines. Give specific examples for each case. **(10 Marks)**

b. A Francis turbine of diameter 3m develops 6750 KW at 300 rpm under a net head of 45m. A geometrically similar model of scale ratio 1:8 is to be tested at a head of 9m. Estimate the size, speed, discharge and power developed by the model. What is the specific speed of the model? Assume overall efficiency of 0.82 for both the prototype and model. **(10 Marks)**

2 a. With the help of T-S diagram, define and very briefly explain the following efficiencies for an expansion process:
i) Total to total efficiency
ii) Static to static efficiency
iii) Polytropic efficiency
iv) Infinite stage efficiency **(10 Marks)**

b. Gases from a combustion chamber inter a gas turbine at total pressure of 7 bar and a total temperature of 1100 K. The total pressure and total temperature at the turbine exit are 1.5 bar and 830 K. Assume $\gamma = 1.3$ and molecular weight of gases = 28.7. Evaluate total to total efficiency and total to static efficiency if exit velocity is 250 m/s. Assume adiabatic steady flow conditions. **(10 Marks)**

3 a. With the usual notations and velocity triangles, derive an alternative form of Euler's Turbine equation and discuss about the components of energy transfer. **(10 Marks)**

b. At a stage in 50% reaction axial flow turbine running at 3000 rpm, the mean diameter is 685 mm. If the maximum utilization for the stage is 0.915, calculate the inlet and outlet absolute velocities for the rotor. Draw the velocity triangles and find power output for a flow rate of 15 kg/s. **(10 Marks)**

4 a. Derive the degree of reaction equation for a centrifugal compressors and pumps. What conclusions can be drawn from that equation? **(10 Marks)**

b. Air flows into a stage of an axial flow compressor at 33°C and 1 bar pressure. The axial speed of air flow throughout the stage is 110 m/s. The compressor is one of 50% reaction with symmetric inlet and outlet velocity triangles, the inlet blade angle being 30° and the outlet angle of 50°. Compute the absolute velocity at the rotor inlet, the mean blade tip speed and the temperature rise of the air in passing through the stage. **(10 Marks)**

PART – B

5 a. For a Parson's turbine, show that the condition for maximum blade efficiency is $\phi_{optimum} = \cos\alpha_1$ and determine the equation for maximum blade efficiency. **(10 Marks)**

b. Steam flows from a nozzle at the rate of 0.2 kg/s and speed 900 m/s. It then enters the rotor of single stage impulse turbine with symmetric blades. The flow leaves the nozzle at an angle of 20°, the mean diameter of the blades is 240 mm and the rotor speed is 18000 rpm. Due to the frictional loss in the rotor blades, kinetic energy of relative flow at rotor exit is 85% of kinetic energy of relative flow entering the rotor. Determine:
   i) The inlet blade angle
   ii) The absolute velocity of steam leaving the rotor
   iii) Power delivered by the turbine. **(10 Marks)**

6 a. Derive an expression for maximum hydraulic efficiency of a Pelton wheel interms of discharge blade angle. **(10 Marks)**

b. The following data is given for a Francis turbine.
Net head = 70 m, speed = 600 rpm, power = 370 kW, overall efficiency = 80%, hydraulic efficiency = 95%, flow ratio = 0.25, breadth ratio = 0.1, outer diameter is twice of inner diameter of runner, the vanes occupy 10% of circumferential area of runner, velocity of flow is constant and discharge is radial at outlet. Determine:
   i) Guide blade angle
   ii) Runner vane angle of inlet and outlet
   iii) The diameter of runner at inlet and outlet
   iv) The width of wheel at inlet. **(10 Marks)**

7 a. Derive an expression for the static pressure rise in the impeller of a centrifugal pump. **(10 Marks)**

b. A 3 stage centrifugal pump is to be designed to handle 60 ltr/s of water at a speed of 900 rpm and under a manometric head of 70 m. The vanes are to be radial at inlet and are to be curved backward at exit at angle of 45°. Assume hydraulic efficiency as 84% and mechanical efficiency as 75%.Consider that vane thickness accounts for 8% of circumferential area. The velocity of flow may be assumed constant at 3 m/s. Determine:
   i) External diameter of each impeller
   ii) External width of each impeller
   iii) Total power input. **(10 Marks)**

8 a. Derive an expression for workdone and static pressure rise in the centrifugal compressor. **(10 Marks)**

b. Air enters a 3 stage axial flow compressor at 1 bar and 300 K. The energy input is 25 kJ/kg per each stage. The stage efficiency is 0.86. Calculate:
   i) The exit static temperature
   ii) The compressor efficiency
   iii) The static pressure ratio **(10 Marks)**

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