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10AL51

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Management and Entrepreneurship

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the various functions of management. **(10 Marks)**
b. Explain the roles of a manager. **(10 Marks)**

2 a. Discuss the importance of planning. Differentiate between strategic planning and tactical planning. **(10 Marks)**
b. With a flow chart, explain the steps involved in decision making. **(10 Marks)**

3 a. What are the principles of an organization? Explain. **(10 Marks)**
b. Explain briefly the steps involved in selection process. **(10 Marks)**

4 a. Explain briefly Herzberg's theory of motivation. **(10 Marks)**
b. What are the essentials of a sound control system? Explain. **(10 Marks)**

PART – B

5 a. Define the term 'Entrepreneur'. Differentiate between entrepreneur and Intrapreneur. **(10 Marks)**
b. Explain the stages in entrepreneurial process. **(10 Marks)**

6 a. What are the steps involved in setting up of small scale industry (SSI)? Explain. **(10 Marks)**
b. What are the objectives and functions of world trade organization (WTO)? Explain. **(10 Marks)**

7 a. Explain the objectives and functions of NSIC and KSFC. **(10 Marks)**
b. Write short notes on KSSIDC and SISI. **(10 Marks)**

8 a. Explain in detail the guidelines for preparation of project report. **(10 Marks)**
b. What are the various network analysis techniques? Differentiate between PERT and CPM. **(10 Marks)**

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10ME52

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Design of Machine Elements – I

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Use of design data handbook is permitted.***
3. ***Assume missing data if any suitably.***

PART – A

1 a. Explain briefly the selection of factor of safety in engineering design. **(03 Marks)**

b. Explain briefly the selection of materials in the process of machine design. **(03 Marks)**

c. A wall bracket with a rectangular cross-section is shown in Fig.Q1(c). The force P acting on the bracket at 60° to the vertical is 5 kN. The material of the bracket is gray cast iron (ordinary) and factor of safety is 2. Determine the cross section of the bracket for maximum normal stress. All dimensions shown are in mm. **(07 Marks)**

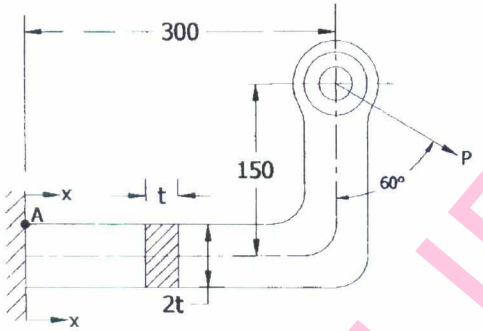

Fig.Q1(c)

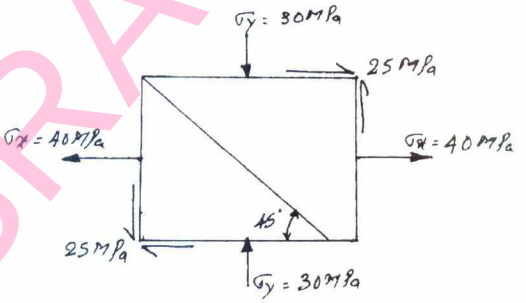

Fig.Q1(d)

d. A point in a structural member subjected to plane stress as shown in Fig.Q1(d). Determine the following:
i) Normal and tangential stress on a plane inclined at 45°.
ii) Principal stresses and directions.
iii) Maximum shear stress. **(07 Marks)**

2 a. Explain theories of elastic failures. Mention five types of theories of elastic failures. **(05 Marks)**

b. An overhang crank with pin and shaft is as shown in Fig.Q2(b). A tangential load of 15 kN acts on the crank Pin. Determine the diameter at section 'XX' using maximum shear stress theory. The crank is made of C60 carbon steel. Take factor of safety as 2. All dimensions are in mm. **(05 Marks)**

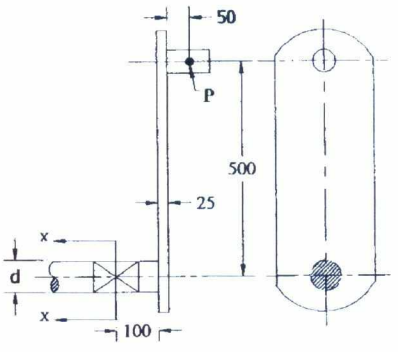

Fig.Q2(b)

c. A flat plate subjected to a tensile force of 5 kN is an shown in Fig.Q2(c). The plate material is gray cast iron (good) and the factor of safety is 2.5. Determine the thickness of the plate. All dimensions are in mm. **(07 Marks)**

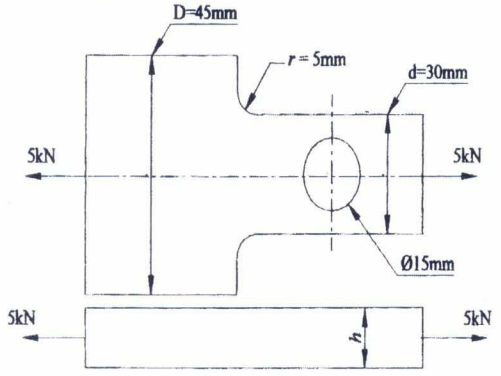

Fig.Q2(c)

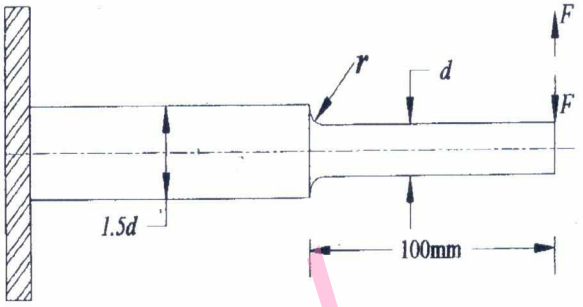

Fig.Q3(c)

d. Design a rod of solid circular cross section of length 200 mm (placed vertical) to sustain an axial compressive load of 1000 N, that falls on it from a height of 10 mm. The material selected has a design stress of 80 N/mm^2 and E = 2.1 × 10^5 N/mm^2. **(03 Marks)**

3 a. Explain stress versus number of cycles (S-N) curve for ferrous and non-ferrous metals with the aid of experimental sketch and characteristic curves. **(06 Marks)**

b. Derive Soderberg equation. **(06 Marks)**

c. A stepped shaft of circular cross section shown in Fig.Q3(c) is made of SAE 1045 annealed steel. The load is repeated and completely reversed with a value of 100,000 N. Taking $\frac{r}{d} = \frac{1}{8}$, determine the diameter 'd' and the fillet radius 'r' so that the maximum stress will be limited to a value corresponding to a factor of safety 2. Consider the load factor = 1, surface finish factor = 0.85 and size factor = 0.9. **(08 Marks)**

4 a. A flat circular plate is used to close the flanged end of a pressure vessel of internal diameter 300 mm. The vessel carries a fluid pressure of 0.7 N/mm^2. A soft copper gasket is used to make the joint leak proof. Twelve bolts are used to fasten the cover plate on the pressure vessel. Find the size of the bolt, so that the stress in the bolt not to exceed 100 N/mm^2. **(10 Marks)**

b. The structural joint shown in Fig.Q4(b) is subjected to an eccentric load P of 10 kN with an eccentricity of 500 mm from the center of gravity of the bolts arrangement. Distance between the bolts is 200 mm and 150 mm perpendicular and parallel to the direction of the load acting. Bolts are identical and made of plain carbon steel having yield strength of 400 N/mm^2. Determine the size of the bolts taking factor of safety as 2.5.

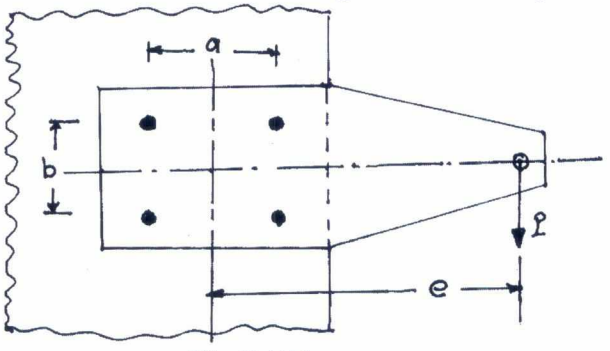

Fig.Q4(b) **(10 Marks)**

PART – B

5 A uniform circular carbon steel shaft made of SAE 1025 annealed is mounted on two bearings 850 mm apart as shown in the Fig.Q5. The shaft carries a gear 'A' at 200 mm to the right of the left bearing and a pulley 'B' at 250 mm to the left of the right bearing. The gear is subjected to horizontal pressure of 3500 N and a vertical upward pressure of 9600 N. The pulley is driven by a belt with a tension on tight side to be 6000 N and on the slack side to be 2000 N. The shock and fatigue factors for bending and torsion as $K_m = 2$ and $K_t = 1.5$ respectively and weight of the pulley to be 1500 N. Design the diameter of the shaft for yield stress taking factor of safety as 3. Draw neatly the sketch with loading and bending moment diagrams.

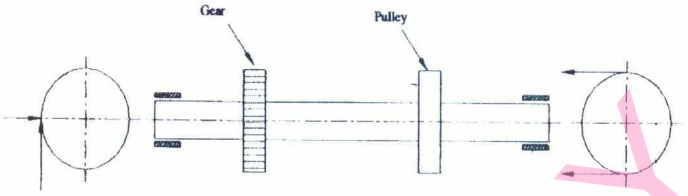

Fig.Q5 **(20 Marks)**

6 a. Design a Cotter joint for an axial load of 50 kN which alternately changes from tensile to compressive, assuming allowable stresses in the components under tension and compression as 52.5 N/mm^2, bearing stress as 63 N/mm^2 and shearing stress as 35 N/mm^2. Sketch neatly the joint and show dimensions. **(15 Marks)**

b. A square key is used to key a gear and a shaft of diameter 35 mm. The hub length of the gear is 60 mm, Both key and shaft is made of same material having allowable shear stress of 55 MPa. What are the dimensions of the key according to maximum stress theory if 395 N-m of torque is to be transmitted? **(05 Marks)**

7 a. Two mild steel tie bars, for a bridge structure are to be joined by means of butt joint with double cover plates. The thickness of the tie bar is 15 mm and caries a tensile load of 300 kN. Design an economical joint completely taking the allowable stresses as $\sigma_t = 80$ MN/m^2, $\sigma_c = 160$ MN/m^2 and $\tau = 64$ MN/m^2. Draw neatly a proportional top and front views of the arrangement of rivets with dimensions. **(14 Marks)**

b. A 125 × 100 × 10 mm unequal leg angle section is to be welded to a steel plate by fillet welds along the edges of the 125 mm leg as shown in Fig.Q7(b). The angle is subjected to a tensile load of 100 kN passing through the center of gravity of angle. Determine the weld lengths if the size of the weld is 8 mm and allowable shear stress in the weld is 102 MN/m^2. All dimensions in the figure are in mm.

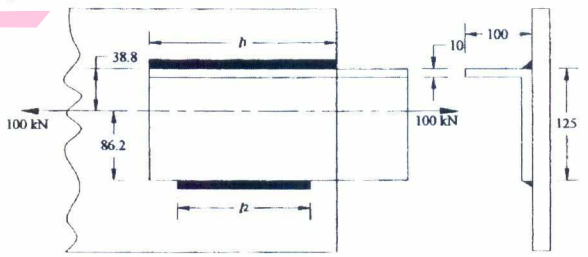

Fig.Q7(b) **(06 Marks)**

8 a. Derive the equation for torque required to lift the load on square thread screws. **(08 Marks)**

b. Define self locking and overhauling of power screw. **(04 Marks)**

c. A machine slide weighing 20 kN is raised by a double start square threaded screw at the rate of 0.84 m/min. take $\mu = 0.12$ and $\mu_c = 0.14$. The outside diameter of the screw is 44 mm and the pitch is 7 mm. The outside and inside diameter of the collar at the end of the screw are 58 mm and 32 mm respectively. Calculate the power required to drive slide. If the allowable shear stress in the screw is 30 MPa, is the screw strong enough to sustain load. **(08 Marks)**

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10ME53

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Energy Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain with neat sketch, over feed and under feed principle of firing coal. **(06 Marks)**

b. What is Pulverized coal? Discuss the advantages and disadvantages of pulverized coal. **(06 Marks)**

c. Explain the pneumatic ash handling system, with a neat sketch. **(08 Marks)**

2 a. With a neat sketch, explain the Benson boiler. **(06 Marks)**

b. Estimate the height of chimney required to produce a static draft of 16mm of water if the mean temperature of the flue gases in the chimney is 255^0C and the temperature of outside air is 25^0C. The densities of atmospheric air and the flue gases at N.T.P are 1.293 and 1.34 kg/m^3 respectively. **(04 Marks)**

c. Explain with a neat sketch, the working of natural draught cooling towers and hyperbolic cooling tower. **(10 Marks)**

3 a. Draw a line diagram to show the layout of diesel power plant and describe it in brief. **(10 Marks)**

b. What are the merits and demerits of diesel power plant? **(04 Marks)**

c. Explain different methods of starting of diesel engine. **(06 Marks)**

4 a. State the important factors to be considered while selecting the site for hydro – electric power plant. **(05 Marks)**

b. With a neat sketch and explain pumped storage plant. **(05 Marks)**

c. Mean monthly discharge for 12 months at particular site of river is tabulated below :

Month	J	F	M	A	M	J	J	A	S	O	N	D
Discharge in millions of m^3/month	45	30	20	15	0	50	75	100	110	70	60	40

Draw : i) Hydro graph and flow duration curve for the given discharge and find the average monthly flow.

ii) Power available at mean flow of water. If the available head is 80 meters. At site and overall efficiency is 80%. Take 30 days in month. **(10 Marks)**

PART – B

5 a. Explain the principle of release of nuclear energy by fusion reaction. **(06 Marks)**

b. With the help of a neat diagram, explain the working of pressurized water reactor. **(08 Marks)**

c. Explain : i) Thermal utilization factor ii) Multiplication factor. **(06 Marks)**

6 a. What are the main applications of the solar pond? Explain with the help of a neat sketch a solar pond electric power plant. **(10 Marks)**

b. Wind at 1 standard atmospheric pressure and 20^0C has velocity of 12m/s. The turbine has diameter of 120m and operating speed in 40 rpm at maximum efficiency. Calculate i) Total power density ii) Maximum power density iii) Obtainable power density assuming $\eta = 35\%$ iv) Total power v) Total torque. **(10 Marks)**

7 a. Explain the principle of working of OTEC. Explain with a sketch, Rankine cycle OTEC plant. **(08 Marks)**

b. Explain the method of harnessing tidal energy using the double basin system. **(06 Marks)**

c. With a neat sketch, explain the working of flash steam type system geothermal plants. **(06 Marks)**

8 a. Explain the phenomenon of photosynthesis. **(04 Marks)**

b. Explain the working of Downdraught gasifier, with a neat sketch. **(08 Marks)**

c. What is Energy plantation? Explain the factor affecting bio gas generation. **(08 Marks)**

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10ME54

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Dynamics of Machines

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Considering slider crank mechanism, state and explain principle of virtual work. **(08 Marks)**

b. A four bar mechanism shown in Fig.Q1(b) is acted upon by a force P = 100 ∠120° N on link CD. The dimensions of the various links are AB = 40 mm, BC = 60 mm, CD = 50 mm, DA = 30 mm and DE = 20 mm. Determine the magnitude and direction of input torque T_2 on link AB for the static equilibrium of the mechanism.

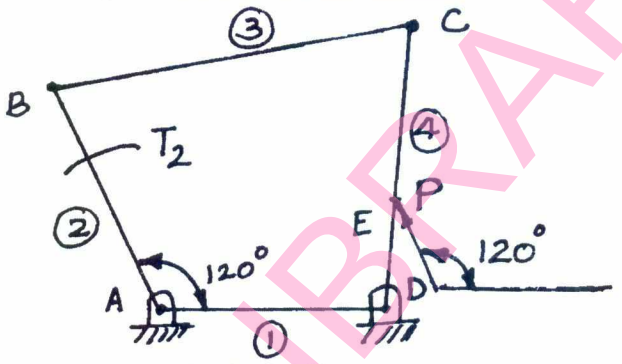

Fig.Q1(b) **(12 Marks)**

2 a. Prove that the maximum fluctuation of energy E_f is given by $E_f = 0.02C_SE$, where E = mean kinetic energy of flywheel, C_S = total percentage fluctuation of speed. **(06 Marks)**

b. A punching machine is operated by an electric motor which supplies a constant torque. The motor delivers 3.68 KW. At the commencement of operation the flywheel of the punching machine has a speed of 300 rpm. The moment of inertia of the flywheel is 60 kgm^2. Each punching operation requires 5600 Nm of energy and actual punching takes 1 second. Find:
i) The number of punchings that can be made in an hour.
ii) The reduction in speed after punching is over. **(14 Marks)**

3 a. Derive the expression for frictional torque in a single flat collar bearing. Assume uniform pressure. **(08 Marks)**

b. A shaft rotating at 300 rpm transmitting 5 KW power to drive another shaft at 500 rpm through a flat belt drive. The belt is 120 mm wide and 15 mm thick. The distance between the centres of shafts is 3m, The effective diameter of smaller pulley is 0.75 m. Calculate the stress in the belt, if it is (i) an open belt drive, (ii) a cross belt drive. Take the coefficient of friction between the belt and pulley is 0.3. **(12 Marks)**

4 a. Explain static and dynamic balancing of a system of revolving masses. **(06 Marks)**

b. A shaft carries four rotating masses A, B, C and D which are completely balanced. The masses at A, B and C are 60 kg, 55 kg and 80 kg respectively rotating at equal radii. The distance between B, C and D from A are 500 mm, 600 mm and 1300 mm respectively. Determine the mass at D and angular positions of masses B, C and D with respect to mass A. **(14 Marks)**

PART – B

5 a. A V-twin engine has the cylinder axes at right angles and the connecting rods operate a common crank. The reciprocating mass per cylinder is 10 kg and the crank radius is 80 mm. The length of the connecting rod is 0.4 m. Show that the engine may be balanced for primary forces by means of a revolving mass. If the engine speed is 600 rpm, determine the value of maximum resultant secondary force. **(04 Marks)**

b. A four crank engine has two outer cranks set at 120° to each other and their reciprocating masses are each 400 kg. The distance between planes of rotation of adjacent cranks are 450 mm, 750 mm and 600 mm. If the engine is to be in complete balance, find the reciprocating mass and the relative angular position for each of the inner cranks. If the length of each crank is 300 mm, the length of each connecting rod is 1.2 m and the speed of rotation is 240 rpm, find maximum secondary unbalanced force. **(16 Marks)**

6 a. Derive the expression for speed of a porter Governor with usual notations, taking friction into account. **(08 Marks)**

b. In a porter Governor, the arms and links are each 250 mm long and intersect on the main axis. Each ball weigh 4.5 N and the central load is 20 N. The sleeve is in its lowest position when the arms are inclined at 30° to the axis. The lift of the sleeve is 50 mm. Find force of friction at the sleeve, if the speed ascent from the lowest position is equal to the speed at the beginning of the descent from the highest position. Also find range of speed, all things remaining same. **(12 Marks)**

7 a. Explain the effect of gyroscopic couple on an aeroplane. **(08 Marks)**

b. A rear engine automobile is travelling along a track of 100 m radius. Each of the four wheels has a moment of inertia of 2 kgm^2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.25 kgm^2. The engine axis is parallel to the rear axle and the crank shaft rotates in the same direction as the wheels. The gear ratio of engine to back axle is 3:1. The automobile mass is 1500 kg and its centre of gravity is 0.5 m above the 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 the wheels to maintain contact with the road surface. **(12 Marks)**

8 a. Derive the expressions for displacement, velocity and acceleration for a circular arc cam operating a flat faced follower when the flat face of the follower has contact on the circular flank. **(10 Marks)**

b. A cam of circular arc type is to operate a flat faced follower of a four stroke engine. The exhaust valve opens 50° before top dead centre and closes 15° after bottom dead centre. The valve lift is 10 mm, base circle radius of cam is 20 mm and nose radius is 3 mm. Calculate the maximum velocity, acceleration and retardation, if cam shaft rotates at 1800 rpm. **(10 Marks)**

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10ME55

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Manufacturing Process – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define true stress and true strain. Derive expressions showing the relationship between true stress and engineering stress as well as true strain and engineering strain. **(10 Marks)**

b. Explain with a neat sketch the hydrostatic pressure in metal working. **(05 Marks)**

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

2 a. Explain the effect of the following on metal working processes (i) temperature, (ii) friction and lubrication. **(10 Marks)**

b. Write a note on: i) deformation zone geometry, (ii) residual stresses in wrought products. **(10 Marks)**

3 a. With neat sketches, describe various types of forging processes. **(06 Marks)**

b. Explain die design parameters in forging, with a neat figure. **(08 Marks)**

c. Explain "friction hill concept" and the factors affecting it in forging. **(06 Marks)**

4 a. Explain with neat sketch of rolling mill (i) four high rolling mill, (ii) tandem rolling mill. **(10 Marks)**

b. Discuss the effect of front tension and back tension on the rolling process, with neat figures. **(08 Marks)**

c. List defects in rolling. **(02 Marks)**

PART – B

5 a. Using neat sketches explain Rod drawing and wire drawing. **(08 Marks)**

b. With neat sketch, briefly explain the different features of a drawing die. **(04 Marks)**

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

6 a. Give the classification of extrusion processes and explain any two processes with neat sketch. **(10 Marks)**

b. Explain the following:
i) Metal flow and deformation during extrusion
ii) Defects in extrusion **(10 Marks)**

7 a. With neat sketches, explain combination die and progressive die. List the type of components produced in sheet metal work. **(10 Marks)**

b. Write a note on forming limit criteria (Keeler-Goodwin diagram). **(05 Marks)**

c. It is required to punch a hole of 10 mm dia in a mild steel plate of 10 mm thickness. Determine whether it is feasible or not, taking shear strength of the plate as 600 N/mm^2 and compressive strength of the punch as 2000 N/mm^2. If it is not possible, what could be done to produce this hole? **(05 Marks)**

8 a. What is HERF? Explain explosive forming, with a neat figure. **(08 Marks)**

b. With a flow chart, explain in detail the powder metallurgy process. **(08 Marks)**

c. Explain any two methods of production of metal powder with sketches. **(04 Marks)**

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10ME56

Fifth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Turbo Machines

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. ***Missing data may be suitably assumed.***

PART – A

1 a. Enumerate the differences between Positive Displacement Machines and Turbomachines with reference to its action, energy conversion process and volumetric efficiency. **(06 Marks)**

b. With usual notations, derive expressions for Unit Discharge coefficient, Head coefficient and Power coefficient using Dimensional Analysis. **(08 Marks)**

c. The quantity of water available for a hydroelectric power station is 260m^3/sec. The head developed is 1.73m. If the speed of the turbines is 50 rpm and the efficiency 82.5%, find the number of turbines. Assume specific speed to be 760. **(06 Marks)**

2 a. With usual notations, derive an expression for infinitesimal stage efficiency during compression process with the aid of TS plot. **(10 Marks)**

b. A 9 stage centrifugal compressor has overall stage pressure ratio 2.82. Air enters the compressor at 1 bar and 15^{0}C. The efficiency of the compressor is 88%. Determine the following : i) Pressure ratio of each stage ii) Polytropic efficiency iii) Preheat factor. **(10 Marks)**

3 a. The velocity of the steam in a De Laval Turbine at the inlet is1200m/sec. The nozzle angle at the inlet is 22^0 and blades are equiangular. Assuming relative velocities of the fluid at inlet and exit to be equal and tangential speed of the rotor is 400m/sec. Determine the following : i) Blade angles at inlet and exit ii) Power developed in kW, if mass flow rate is 1kg/sec iii) Tangential force exerted on the rotor blade ring iv) Utilization factor. **(10 Marks)**

b. Show that for an axial flow turbine subjected under maximum utilization factor condition, the speed ratio ϕ is given by 2/3 cos α_1, where 'U' is the tangential speed of the rotor and 'V_1' is the tangential jet velocity of the fluid. Assume flow velocity to remain constant and 'α_1' is the nozzle angle. Take Degree of Reaction R = ¼. **(10 Marks)**

4 a. The total power input at a stage in an axial – flow compressor with symmetric inlet and outlet velocity triangles (R = 0.5) is 27.85 kJ/kg of air flow. If the blade speed is 180m/sec throughout the rotor, draw the velocity triangles and compute the inlet and outlet rotor blade angles. Do you recommend the use of such compressors? Comment on the results you have obtained. Assume axial velocity component to be 120m/sec. **(10 Marks)**

b. An inward flow radial reaction turbine has axial discharge at outlet. The outer blade angle is 45^0. The radial velocity of the flow remain constant. Assuming the tangential speed of the rotor at inlet to be twice the tangential speed of the rotor at exit, determine the energy transfer per unit flow depending on mass and degree of reaction. Assume $V_m = \sqrt{2g}$. If the values of degree of reaction respectively are '0' and '1', what are the corresponding values of energy transfer per unit mass of the fluid? **(10 Marks)**

PART – B

5 a. Define a steam turbine. List out the differences between Impulse and Reaction steam turbines. **(08 Marks)**

b. Briefly explain Velocity Compounding. **(04 Marks)**

c. In a reaction turbine, the inlet and outlet blade angles are 50^0 and 20^0 respectively. Steam enters at 18^0 to the plane of the rotor wheel and leaves at 40^0. The rotor speed is 260m/sec. Calculate the speed ratio, specific work and degree of reaction. **(08 Marks)**

6 a. Prove that the hydraulic efficiency of Pelton wheel is given by $\frac{1+C_b \cos\beta_2}{2}$, where '$C_b$' is Bucket velocity coefficient and β_2 is the runner tip angle. **(08 Marks)**

b. Explain the function of a draft tube. **(04 Marks)**

c. An inward flow reaction turbine with radial discharge having overall efficiency 80% when power developed is 147 kW. The head is 8m. The peripheral velocity of the fluid is $0.96\sqrt{2gH}$ and flow velocity of the fluid is $0.36\sqrt{2gH}$. The speed of the rotor is 1500 rpm and hydraulic energy losses is 22% of available energy. Determine the following :
i) Inlet guide vane and blade angles ii) Diameter of the rotor iii) Width of the rotor. **(08 Marks)**

7 a. Define a Centrifugal pump. With usual notations, derive theoretical head – capacity relationship for a centrifugal pump. **(08 Marks)**

b. What is Cavitation? What are its effects? **(04 Marks)**

c. Show that the pressure rise in the impeller of a centrifugal pump is given by $\frac{P_2 - P_1}{\rho g} = \frac{1}{2g}\left[V_{f_1}^2 + u_2^2 - V_{f_2}^2 \operatorname{cosec}^2 \beta_2\right]$, where V_{f_1} & V_{f_2} are the flow velocities and β_2 is the outlet Blade angle. **(08 Marks)**

8 a. Explain Surging, Stalling and Slip factor with reference to a compressor. **(08 Marks)**

b. The impeller tip speed of a centrifugal compressor is 370m/sec, slip factor is 0.9, and the radial component at the exit is 35m/sec. If the flow area at the exit is $0.18m^2$ and compressor efficiency is 88%. Determine the mass flow rate of air and the absolute Mach number at impeller tip. Assume air density = $1.57kg/m^3$ and inlet stagnation temperature is 290K. Neglect the work input factor. Also find the overall pressure ratio of the compressor. **(12 Marks)**

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