USN | | | | | | | | | | |

10AL51

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Management and Entrepreneurship

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define management. Write various characteristics of management. **(05 Marks)**
b. Briefly explain the various levels and skills required at different management levels. **(05 Marks)**
c. Explain the various functions of management. **(10 Marks)**

2 a. Define planning and discuss its importance. **(05 Marks)**
b. Write differences between strategic planning and tactical planning. **(05 Marks)**
c. Explain various steps of planning. **(10 Marks)**

3 a. What is an organization? Explain the purpose and nature of an organization. **(05 Marks)**
b. What are principles of organization? **(05 Marks)**
c. Briefly explain the steps in the selection procedure. **(10 Marks)**

4 a. Explain Maslow's theory of motivation. **(05 Marks)**
b. What are the qualities of a good leader? **(05 Marks)**
c. Briefly explain the essentials of sound controlling. **(10 Marks)**

PART – B

5 a. What are the qualities of an entrepreneur? **(05 Marks)**
b. Explain the types of entrepreneur. **(05 Marks)**
c. Explain the various stages in entrepreneurial process. **(10 Marks)**

6 a. Enumerate the characteristics of small scale industries. **(05 Marks)**
b. Describe the objectives of small scale industries in India. **(05 Marks)**
c. Explain the steps involved in setting up a small scale industry. **(10 Marks)**

7 a. Mention important central and Karnataka state government institutions providing support to SSIs. **(05 Marks)**
b. What are the objectives and functions of KIADB? **(05 Marks)**
c. Write short notes on any two:
i) Karnataka State Finance Corporation (KSFC).
ii) Karnataka State Small Industries Development Corporation (KSSIDC).
iii) District Industries Centre (DIC). **(10 Marks)**

8 a. Write various points to be considered for project identification. **(05 Marks)**
b. Write differences between PERT and CPM. **(05 Marks)**
c. Explain in detail the contents of "Project Report". **(10 Marks)**

* * * * *

USN | | | | | | | | | | |

10ME52

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
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. *Using of design data hand book is permitted.*
3. *Assume missing data suitable.*

PART – A

1 a. Explain : (i) Mechanical engineering design (ii) Standards in design. **(04 Marks)**

b. A point in a structural member subjected to plane stress shown in Fig. Q1 (b). Determine the principal stresses and their direction. **(08 Marks)**

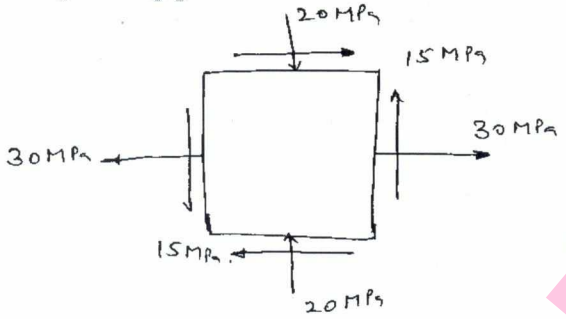

Fig. Q1 (b)

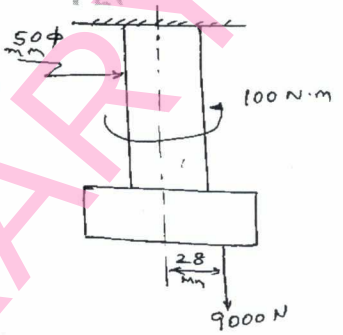

Fig. Q1 (c)

c. A 50 mm diameter steel rod supports a 9.0 kN load and in addition is subjected to a torsional moment of 100 N-m as shown in Fig. Q1 (c). Determine the maximum tensile and the maximum shear stress. **(08 Marks)**

2 a. In a plate of C45 steel (σ_y = 353 MPa) subjected to a system of loads, following stresses are induced at critical point : σ_x = 150 N/mm^2, σ_y = 100 N/mm^2 and τ_{xy} = 50 N/mm^2. Find the factor of safety according to,
(i) Maximum normal stress theory.
(ii) Maximum shear stress theory.
(iii) Distortion energy theory. **(08 Marks)**

b. Determine the safe load that can be carried by a bar of rectangular cross section shown in Fig. Q2 (b) limiting the maximum stress to 130 MPa taking stress concentration into account. **(06 Marks)**

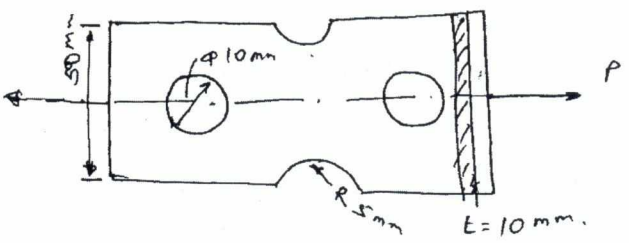

Fig. Q2 (b)

c. An unknown weight falls through 20 mm as to a collar rigidly attached to the lower end of a vertical bar 2 meter long and 500 sq mm section. If the maximum instantaneous extension is 2 mm, what is the corresponding stress and the value of unknown weight? Take E = 200 GPa. **(06 Marks)**

3 a. Derive the Soderberg equation. **(05 Marks)**

b. A hot rolled steel rod is subjected to a torsional load that varies from +330 N.m, clockwise to 110 N.m counter clockwise and an applied bending moment varies from +440 N.m to –220 N.m. The rod is of uniform cross section. Determine the required rod diameter. The material has an ultimate tensile strength of 550 MPa and yield strength of 410 MPa. Design based as a factor of safety of 1.5. Take the endurance limit as half of the ultimate strength. **(15 Marks)**

4 a. A cylinder head is fastened to the cylinder of an air compressor using 8 numbers of bolts. Inner diameter of cylinder is 300 mm. The pressure inside the cylinder varies from zero to a maximum pressure of 1.5 N/mm^2. The stresses for the bolt material may be taken as $\sigma_{ut} = 500$ N/mm^2, $\sigma_y = 300$ N/mm^2 and $\sigma_{en} = 240$ N/mm^2. The bolts are tightened with initial preload of 1.5 times the steam load. A copper asbestos gasket is used to make the joint leak proof. Assuming factor of safety 2.5, find the size of bolt. Neglect stress concentration factor. **(10 Marks)**

b. A M10 steel bolt of 125 mm long is subjected to an impact load. The kinetic energy absorbed by the bolt is 2.5 Joules. Determine (i) Stress in the shank of the bolt if there is no threaded portion between the nut and the bolt head. (ii) Stress in the shank of the area of the shank is reduced to that of the root area of the threaded or the entire length of the bolt is threaded. **(10 Marks)**

PART – B

5 A commercial shaft 1 metre long supported between bearings has a pulley of 600 mm diameter weighing 1 kN, driven by a horizontal belt drive keyed to the shaft at a distance of 400 mm to the left of th e right bearing and receives 25 kW at 1000 rpm. Power from the shaft is transmitted from the 20° spur pinion of a pitch circle diameter 200 mm which is mounted at 200 mm to the right of the left bearing to a gear such that tangential force on the gear acts vertically upwards. Take the ratio of the belt tension is 3. Determine the standard size of the shaft based on maximum shear stress theory. Assume $C_m = 1.75$, $C_t = 1.25$ **(20 Marks)**

6 a. Design a socket and spigot type cotter joint to sustain and axial load of 100 kN. The material selected for the joint has the following design stresses $\sigma_t = 100$ N/mm^2, $\sigma_c = 150$ N/mm^2 and $\tau = 60$ N/mm^2. **(10 Marks)**

b. Design a cast iron flanged couplings for a steel shaft transmitting 100 kW at 250 rpm. Take the allowable shear stress for the shaft as 40 N/mm^2 . The angle of twist is not to exceed 1° in a length of 20 diameters. Allowable shear stress for the bolts is 13 N/mm^2. The allowable shear stress in the flange is 14 N/mm^2. for the key shear stress is 40 N/mm^2 and compressive stress is 80 N/mm^2. **(10 Marks)**

7 a. A bracket having a load of 15 kN is to be welded as shown in Fig. Q7 (a). Find the size of weld required of allowable shear stress is not to exceed 80 N/mm^2. **(08 Marks)**

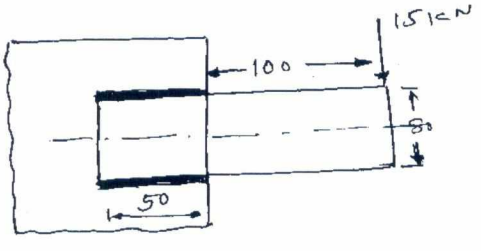

Fig. Q7 (b)

7 b. Design a double riveted butt joint with two cover plates for the longitudinal beam of a boiler shell 1.5 m in diameter subjected to a steam pressure of 0.95 N/mm^2. Assume an efficiency of 75%, allowable tensile stress in the plate of 90 N/mm^2, allowable crushing stress of 140 N/mm^2 and an allowable shear stress in the rivet of 50 N/mm^2. **(12 Marks)**

8 a. Explain overhauling of screws. Derive the condition for self locking of square thread with collar friction. **(05 Marks)**

b. A weight of 500 kN is raised at a speed of 6 m/min by a two screw rods with square threads of 50 $\times$8 cut on them. The two screw rods are driven through level gear drives by a motor. Determine (i) The torque required to raise the load (ii) The speed of rotation of the screw rod assuming the threads are double start (iii) The maximum stresses induced in screw rod. (iv) The efficiency of screw drive. (v) The length of nuts for the purpose of supporting the load. **(15 Marks)**

* * * * *

USN | | | | | | | | | | |

10ME53

Fifth Semester B.E. Degree Examination, Dec.2013 / Jan. 2014
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. Sketch and explain traveling grate stoker. **(07 Marks)**

b. Write the advantages and disadvantages of using pulverized coal in thermal power plants. **(05 Marks)**

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

2 a. Sketch and explain Bension boiler. **(07 Marks)**

b. Define draught and explain forced draught, with a neat sketch. **(06 Marks)**

c. Define cooling tower and explain hyperbolic cooling tower, with a neat sketch. **(07 Marks)**

3 a. Draw the layout of diesel power plant and explain its operation. **(07 Marks)**

b. Explain thermo Syphon cooling with a neat sketch. **(07 Marks)**

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

4 a. Draw the general layout of hydel power plant. **(04 Marks)**

b. Differentiate the following with reference to hydel power plant :
i) Pondage and storage ii) Base load and peak load plants. **(06 Marks)**

c. The discharge through a monsoon stream are tabulated below :

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Discharge m^3/s	2.0	1.5	1.0	0.6	0.0	0.0	8.0	10.0	12.0	6.0	4.0	3.0

i) Draw the hydrograph and calculate the average flow.
ii) Determine the capacity of the reservoir for the obtained average flow if a dam is constructed across the stream.
iii) If the mean level of water on the upstream side is 100m above the tail race, find the power in kW that could be generated assuming 80% generator efficiency. **(10 Marks)**

PART - B

5 a. Define nuclear reactor. Sketch and explain nuclear reactor. **(08 Marks)**

b. Explain boiling water reactor with a neat sketch. **(06 Marks)**

c. Write a note on : i) Radiation hazards and ii) Radioactive waste disposal. **(06 Marks)**

6 a. Explain one typical method of harnessing energy from the given below natural sources with a neat sketch : i) Solar energy ii) Wind energy. **(14 Marks)**

b. Write the advantages and disadvantages of non – conventional energy conversions. **(06 Marks)**

7 a. Explain the principle of harnessing energy from the following sources of energy, with a neat sketch : i) Tidal energy ii) Ocean thermal energy and iii) Geothermal energy. **(15 Marks)**

b. Explain the principle by which tides are formed. **(05 Marks)**

8 a. Explain the factors affecting biogas generation. **(04 Marks)**

b. Explain the principle by which biogas is produced, with a neat sketch. **(10 Marks)**

c. Explain i) Anaerobic fermentation ii) Photo synthesis. **(06 Marks)**

*****

USN | | | | | | | | | | |

10ME54

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Dynamics of Machines

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. ***Assume missing data suitably.***

PART – A

1 a. What are the free body diagrams of a mechanism? **(05 Marks)**

b. For a mechanism shown in Fig. Q1 (b), find the required input torque for the static equilibrium. The lengths OA and AB are 250 mm and 650 mm respectively. F = 500 N. **(15 Marks)**

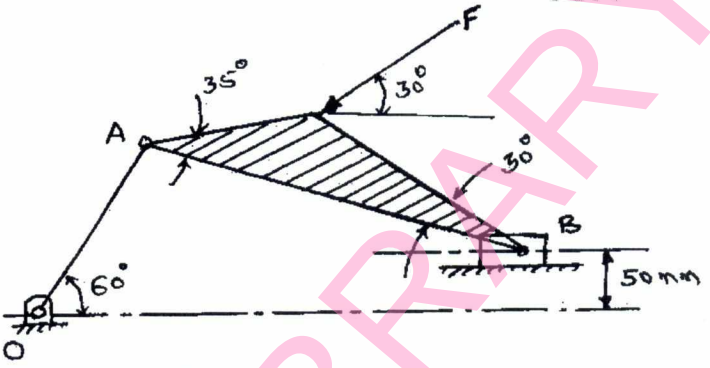

Fig. Q1 (b)

2 a. Derive an equation for the maximum fluctuation of energy of a flywheel in terms of mean kinetic energy and coefficient of fluctuation of speed. **(06 Marks)**

b. A punching press is driven by a constant torque electric rotor. The press is provided with a flywheel that rotates at a maximum speed of 225 rpm. The radius of gyration of the flywheel is 0.5 m. The press punches 720 holes per hour, each punching operation takes two seconds and requires 15 kN-m energy. Find the power of the motor and the minimum mass of the flywheel if speed of the same is not to fall below 200 rpm. **(14 Marks)**

3 a. Derive an equation to calculate the centrifugal tension in a flat belt drive. **(05 Marks)**

b. Determine the width of a 9.75 mm thick belt required to transmit 15 kW from a motor running at 900 rpm. The diameter of the driving pulley of the motor is 300 mm. The driven pulley runs at 300 rpm and distance between centres of two pulleys is 3 mts. The density of leather is 1000 kg/m^3. The maximum allowable stress in leather is 2.5 MPa. The coefficient of friction between leather and pulley is 0.3. Assume open belt drive and neglect slip in belt drive. **(15 Marks)**

4 A shaft is supported in bearings 1.8 meter apart and projects 0.45 meter beyond bearings at each end. The shaft carries three pulleys one at each end and one at middle of its length. The mass of end pulleys 48 kg and 20 kg and their centre of gravity are 15 mm and 12.5 mm respectively from the shaft axis. The centre pulley has the mass of 56 kg and its centre of gravity is 15 mm from shaft axis. If the pulleys are so arranged as to give static balance, determine (i) The relative angular position of the pulleys. (ii) And dynamic forces produced on the bearings when the shaft rotates at 300 rpm. **(20 Marks)**

PART – B

5 a. Define primary unbalanced force and secondary unbalanced force for a reciprocating engine mechanism. **(04 Marks)**

b. The firing order in a six cylinder four stroke inline engine is 1–4–2–6–3–5. The piston stroke is 100 mm and length of each connecting rod is 200 mm. The pitch distance between cylinder centre lines are 100 mm, 100 mm, 150 mm, 100 mm and 100 mm respectively. The reciprocating mass per cylinder is 1 kg and engine runs at 300 rpm. Determine the output of primary and secondary forces and couples on the engine, taking a plane midway between the cylinders 3 and 4 as reference plane. **(16 Marks)**

6 a. Establish the relationship between speed and height of a watt Governor. **(04 Marks)**

b. In a portor governor the upper and lower arms are each 250 mm long and pivoted on the axis of rotation. The mass of each rotating ball is 3 kg and mass of the sleeve is 20 kg. The sleeve is in its lowest position when the arms are inclined at 30° to governor axis. The lift of the sleeve is 36 mm. Find the force of friction at the sleeve, if the speed at the moment it rises from the lowest position is equal to the speed at the moment it falls from the highest position. Also find the range of speed of the governor. **(16 Marks)**

7 a. With neat sketches, explain the effect of gyroscopic couple on steering, pitching and rolling of ship. **(06 Marks)**

b. A rear engine automobile is traveling along a track of 100 meters mean radius. Each of four road wheels has a moment of inertia of 2.5 kg-m^2 and an 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 rear axle and the crankshaft 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 track of vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all the four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to four wheels. **(14 Marks)**

8 For a symmetrical tangent cam operating a roller follower, the least radius of cam is 30 mm and roller radius is 15 mm. The angle of ascent is 60°, the total lift is 15 mm and speed of the camshaft is 300 rpm. Calculate : (i) Principal dimensions of the cam (i.e. the distance between the cam centre and nose centre, nose radius and angle of contact of cam with straight flank). (ii) Acceleration of the follower at the beginning of the lift, where the roller just touches the nose and at the apex of circular nose. Assume that there is no dwell between ascent and descent. **(20 Marks)**

* * * * *

USN | | | | | | | | | | |

10ME55

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014

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. How the metal working processes are classified? Explain. **(06 Marks)**

b. Define re-crystallization. Distinguish hot working from cold working. **(06 Marks)**

c. Derive an expression for the following with respect to yield criteria for ductile material:
i) Von-Mises or distortion energy criteria
ii) Tresca or maximum shear stress criteria. **(08 Marks)**

2 Explain the following parameters which affects the metal working processes:
a. Temperature b. Strain rate effects
c. Hydrostatic pressure d. Deformation zone geometry **(20 Marks)**

3 a. Explain with sketch the procedural steps involved in forging operation. **(06 Marks)**

b. A solid cylindrical slug made of stainless steel is 150 mm diameter and 100 mm height. It is reduced in height by 50% at room temperature by open die forging with flat dies. Assume μ as 0.2 and flow stress as 1000 MPa, calculate forging force at the end of the stroke. **(06 Marks)**

c. Derive an expression for slab analysis to determine the mean pressure for closed die forging. **(08 Marks)**

4 a. Explain with sketch any three types of rolling mills. **(09 Marks)**

b. Derive an expression to determine the roll force and power required in rolling operation. **(06 Marks)**

c. Determine the maximum possible reduction for cold rolling a 300 mm slab when μ is 0.08 and the roll diameter is 600 mm. What is the maximum reduction on the same mill for hot rolling when μ is 0.5? **(05 Marks)**

PART – B

5 a. Explain with sketch the wire drawing and rod drawing operations. **(08 Marks)**

b. Determine the drawing stress to produce 20% reduction in a 10 mm stainless steel wire. The mean flow stress $\bar{\sigma}$ is given as 637 MPa. The die angle is 12° and the μ is 0.09. Also determine the power required to draw when the wire is moving through the die at 3m/sec. **(06 Marks)**

c. Explain with sketch any two methods of tube drawing. **(06 Marks)**

6 a. Explain with sketch the direct extrusion and indirect extrusion processes. **(06 Marks)**

b. Explain with sketch the following extrusion processes:
i) Cold extrusion ii) Hydrostatic extrusion and iii) Impact extrusion **(09 Marks)**

c. Explain in detail the deformation, lubrication and defects in extrusion. **(05 Marks)**

7 a. Explain with sketch the progressive die and combination die in sheet metal forming. **(06 Marks)**

b. Explain with sketch the following operations in sheet metal forming:
i) Deep drawing ii) Stretch forming iii) Rubber press forming **(09 Marks)**

c. Mention defects in sheet metal formed parts. **(05 Marks)**

8 a. Explain with sketch the following high energy rate forming methods:
i) Explosive forming; ii) Electro hydraulic forming; iii) Electromagnetic forming. **(12 Marks)**

b. Explain different steps in powder metallurgy process. **(08 Marks)**

* * * * *

USN | | | | | | | | | | |

10ME56

Fifth Semester B.E. Degree Examination, Dec.2013/Jan.2014
Turbomachines

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of steam tables and Mollier chart is permitted.

PART – A

1 a. Define a turbomachine. With a neat sketch, explain the parts of a turbomachine. **(04 Marks)**

b. Define specific speed of a pump and a turbine. Explain the significance of specific speed. **(06 Marks)**

c. Tests on a turbine runner 1.25m in diameter at 30m head gave the following results, power developed = 736 kW, Speed is 180 r.p.m and the discharge is 2.7 m^3/sec. Find the diameter, speed and discharge of a similar runner to operate at 45m had and give 1472kW at the same efficiency. What is the specific speed of both the turbines? **(10 Marks)**

2 a. Define the term 'infinitesimal' stage efficiencies of a turbine. Show that the polytropic efficiency during the expansion process is given by

$$\eta_p = \frac{\log_e\left(T_2/T_1\right)}{\left(\frac{r-1}{r}\right)\log_e\left(\frac{P_2}{P_1}\right)}.$$ **(08 Marks)**

b. An air compressor has eight stages of equal pressure ratio 1:35. The flow rate through the compressor and its overall efficiency are 50 kg/sec and 82% respectively. If the conditions of air at the entry are 1 bar and 300K, determine:
i) The state of air at compressor exit.
ii) Polytropic efficiency.
iii) Stage efficiency.
iv) Power required to drive the compressor assuming transmission efficiency of 90%. **(12 Marks)**

3 a. With usual notations and velocity triangles derive alternate turbine equation and identify the components of energy transfer. **(10 Marks)**

b. The following data refer to a 50% degree of reaction axial flow turbomachine. Inlet fluid velocity = 230 m/sec, inlet rotor angle = 60°, inlet guide blade angle = 30°, outlet rotor angle = 25°. Find utilization factor, axial thrust and power output per unit mass flow. **(10 Marks)**

4 a. Define degree of reaction for an axial flow machine. Prove that degree of reaction for an axial flow device (assuming constant velocity of flow) is given by

$$R = \frac{V_f}{2U}\left(\frac{\tan\beta_1 + \tan\beta_2}{\tan\beta_1 + \tan\beta_2}\right)$$

Where β_1 and β_2 are the angles made with tangent to the blades. **(10 Marks)**

b. A single stage axial blower with no inlet guide vanes is running at 3600 r.p.m. The mean diameter of the rotor is 16cm and the mass flow rate of air through the blower is 0.45 kg/sec. In the rotor the air is turned such that the absolute velocity of air at exit makes angle of 20° with respect to the axis. Assuming that the axial component of fluid velocity remains constant, determine power input and degree of reaction. Assume that the density of air is constant at 1.185 kg/m^3 and area of flow is 0.02 m^2. **(10 Marks)**

PART – B

5 a. What is the necessity for compounding steam turbines? Discuss any two methods of compounding with neat sketches. Show the velocity and pressure variations across the turbine. **(10 Marks)**

b. In a single stage impulse turbine the mean diameter of the blades is 1m. It runs at 3000 r.p.m. The steam is supplied from a nozzle at a velocity of 350 m/sec and the nozzle at a velocity of 350 m/sec and the nozzle angle is 20°. The rotor blades are equiangular. The blade friction factor is 0.86. Draw the velocity diagram and calculate the power developed if the axial thrust is 117.72 Newton's. **(10 Marks)**

6 a. Classify hydraulic turbines with examples. **(05 Marks)**

b. Two jets strike at buckets of a Pelton wheel, which is having a shaft power as 14,715 kW. The diameter of each jet is given as 150mm. If the net head on the turbine is 500m, find the overall efficiency of the turbine, take C_v = 1.0 and speed ratio = 0.46. If the blade angle at outlet is 15° and reduction in relative velocity over the buckets is 5%, find the hydraulic efficiency. **(10 Marks)**

c. Draw a neat sketch of a Francis turbine and draw the velocity triangles at inlet and outlet. **(05 Marks)**

7 a. With reference to the centrifugal pump explain what do you mean by

i) Net Positive Section Head (NPSH).

ii) Manometric head (h_m). **(06 Marks)**

b. Explain the phenomenon of cavitation in centrifugal pump. **(04 Marks)**

c. A centrifugal pump is designed to run at 1450 r.p.m. with a maximum discharge of 1800 litres/min against a total head of 20m. The suction and delivery pipes are designed such that they are equal in size of 100mm. If the inner diameter and outer diameters of the impeller are 12cm and 24cm respectively, determine the blade angles β_1 and β_2 for radial entry. Neglect friction and other losses. **(10 Marks)**

8 a. Derive an expression for overall pressure ratio for a centrifugal compressor in terms of impeller tip speed, slip, power input factor and isentropic efficiency of compressor. **(12 Marks)**

b. An axial flow air compressor of 50% reaction design has blades with inlet and outlet angles with respect to axial direction of 45° and 10° respectively. The compressor is to produce a pressure ratio of 6:1 with an overall isentropic efficiency of 0.85 with inlet static temperature 37°C. The blade speed and axial velocity are constant throughout the compressor. Assuming a value of 200 m/sec for blade speed, find the number of stages required if work done factor is 0.87 for all stages. **(08 Marks)**

* * * * *