Code No.: **30319/40321** | **MR13/ MR14**

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, JUNE-2018

Subject **Thermal Engineering-II**

Branch: **ME**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. What are primary fuels?
2. What is mean by artificial draught?
3. What do you mean by wet air pump?
4. Write any one method of governing of steam turbines.
5. Write two applications of Gas turbine.

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. What do you mean by stoichiometric air-fuel (A/F) ratio?
2. Define heating value of fuel
3. What is a steam trap?
4. What is the function of fusible plug?
5. What is condenser efficiency?
6. Define the term Steam nozzle.
7. Define Speed ratio.
8. Define Stage efficiency.
9. What is ram effect?
10. What are the applications of rockets.

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

Q1. In a two stage regeneration system, steam at 26 bar and 400°C is supplied at a rate of 127×10^3 kg/hr. The extractions are 10400 kg/hr at 2.9 bar and 8700 kg/hr at 0.6 bar. The condenser pressure is 5 cm of Hg. Actual feed water temperature is 125°C. Find out the percentages of extracted steam at both points and thermal efficiency of the system. The power output from the plant is 25 MW

(OR)

Q2. In a reheat cycle, steam at 165 bar and 600°C is supplied to the turbine. The steam at 18.5 bar during the expansion is withdrawn and reheated to 490°C. Then the expansion is further carried out to condenser pressure of 0.03 bar. (i) Determine the thermal efficiency and (ii) Steam flow rate if the output from the turbine is 60 MW. Assume all ideal processes.

Q3. What do you understand by feed check valve? Explain the working of a feed check valve with a neat sketch.

(OR)

Q4. Derive an expression for maximum discharge rate of gases through the chimney for a given height of the chimney.

Q5.a) State the comparison between jet and surface condensers

b) Explain the effect of air leakage in a condenser.

(OR)

Q6. What is the effect of friction on the flow through a steam nozzle? Explain with the help of h-s diagram.

Q7. Write a note on degree of reaction. Derive an expression for degree of reaction and show that inlet and outlet velocity triangles are symmetrical for a 50% degree of reaction turbine

(OR)

Q8. Following particulars refer to a compound turbine: Inlet pressure and temperature to the first stage are: 20 bar and 250^0C, pressure at entrance to next stage is 1.5 bar and exhaust pressure is 0.05 bar. Stage efficiency is 0.77. Determine i) Internal heat drop, ii) If external losses are 4% of total isentropic heat drop, calculate overall efficiency ratio, iii) Reheat factor.

Q9. Derive an equation for thermal efficiency of a simple gas turbine cycle in terms of pressure ratio and specific heat ratio.

(OR)

Q10 Explain the working difference between propeller jet, turbojet and turbo propeller.

Code No.: **30318/40320**

MR13/ MR14

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Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2018

Subject: **Design of Machine Members – 1**

Branch: **ME**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. What are Preferred Numbers
2. Define notch sensitivity
3. For boiler applications what type of riveted joints are preferred
4. If shaft transmits only power, what type of stresses will develop
5. What is the main purpose of spring

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. List out various manufacturing considerations in the design
2. Explain Normal stress theory and shear stress theory
3. What are the factors that affecting the endurance limit?
4. Suggest two methods for reducing stress concentration.
5. How do you calculate the strength of double fillet parallel weld joint
6. What are various types of threaded forms?
7. What is the main purpose of coupling and what are the properties for good coupling
8. Explain the procedure for designing of hollow shaft fir its rigidity.
9. Differentiate between helical spring and torsion spring.
10. How to find energy stored in a helical spring.

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

Q1. A hallow shaft of 40mm outer diameter and 25mm inner diameter is subjected to a twisting movement of 120N-m, simultaneously it is subjected to an axial thrust of 10KN and a bending movement of 80N-m. Calculate maximum compressive and shear stresses.

(OR)

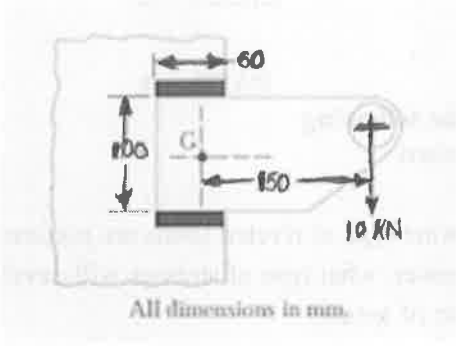
Q2. A rotating shaft of 16 mm diameter is made of plain carbon steel. It is subjected to axial load of 5000 N, a steady torque of 50 N-m and maximum bending moment of 75 N-m. Calculate the factor of safety available based on (i) maximum normal stress theory and (ii) maximum shear stress theory.

Q3. A shaft is subjected to bending moment that varies from +400 N-m to -200 N-m, and a twisting moment at the critical section varies from 300 N-m clockwise to 100 N-m counter-clockwise. Determine the shaft diameter, assuming the stress values, and the other needed information. Take Factor of safety= 2, Ultimate strength= 560 MPa, Yield strength= 320 MPa, Endurance limit= 280 MPa, Load correction factor for variable twisting moment= 0.6, Load correction factor for variable bending moment=1.0, Size factor= 0.85, Surface finish factor= 0.85, Fatigue stress concentration factor= 1.4

(OR)

Q4. A 50 mm diameter shaft made from carbon steel is subjected to a torque, which fluctuates from +2000 N-m to -1000 N-m. Calculate the factor of safety, using Soderberg criteria, Use the following information: Ultimate tensile strength= 600 MPa, Torsional endurance limit= 150 MPa, Fatigue stress concentration factor= 1.4, Size Factor= 0.8, Surface factor= 0.85.

Q5. A bracket as shown in fig. carries a load of 10KN. Find the size of the weld if allowable shear stress is not to exceed 80MPa.



(OR)

Q6. Two plates of 10 mm thickness each are to be joined by means of a single riveted double strap butt joint. Determine the rivet diameter, rivet pitch, strap thickness and efficiency of the joint. Take the working stresses in tension and shearing as 80 MPa and 60 MPa respectively.

Q7. A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5 kW at 300 r.p.m. The pitch circle diameter of the gear is 150 mm. The distances between the centre line of bearings and gear are 100 mm each. If the shaft is made of steel and the allowable shear stress is 45 MPa, determine the diameter of the shaft. Show in a sketch how the gear will be mounted on the shaft; also indicate the ends where the bearings will be mounted? The pressure angle of the gear may be taken as 20°.

(OR)

Q8. Design a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used :
Shear stress for shaft, bolt and key material = 40 MPa
Crushing stress for bolt and key = 80 MPa
Shear stress for cast iron = 8 MPa

Q9. Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN/mm2. Also calculate the maximum shear stress induced.

(OR)

Q10 A semi elliptic leaf spring used for automobile suspension consists of three extra full length leaves and 15 graduated length leaves, including the master leaf. The center to center distance between two eyes of the spring is 1m. The maximum force that can act on the spring is 75mm. For each leaf, the ratio of width to thickness is 9:1. The modulus of elasticity of the leaf material is 207GPa. The leaves are pre stressed in such a way that when the force is maximum, the stresses induced in all leaves are same and equal to 450MPa. Determine the

(i) width and thickness of the leaves
(ii) The initial nip and

The initial preload required to close the gap between extra full length leaves and graduated length leaves.

Code No.: **30316/40318** | **MR13 / MR14**

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III B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, MAY-2018

Subject: **Dynamics of Machines**

Branch: **ME**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. Discuss the gyroscopic effect on sea vessels
2. Define inertia force on linkage
3. Define brake and dynamometer.
4. Define the term magnification factor (MF).
5. How the stability of a governor is checked?

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. What is meant by applied torque and reaction torque?
2. Explain how the gyroscopic couple affects the motion of an aircraft while taking a turn
3. State and explain D'Alembert's principle.
4. What is chebychev spacing? What is its significance?
5. Explain internal expanding shoe brake.
6. A flywheel absorbs 24kg of energy on increasing its speed of 210 rpm to 214 rpm. Determine its kinetic energy at 250rpm.
7. What is meant by vibration isolation and transmissibility?
8. Differentiate between V-8 and V-12 Engines.
9. What is meant by the effort and power of a governor?
10. Distinguish between dead weight and spring loaded governors.

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

1) The turbine rotor of a ship has a mass of 20 tones and a radius of gyration 0.75. Its speed is 2000 rpm. The ship pitches 6° above and below the horizontal position .One complete oscillation takes 18 seconds and the motion is simple harmonic. Determine
   i) The maximum couple tending to shear the holding down bolt of the turbine
   ii) The maximum angular acceleration of the ship during pitching.
   iii) The direction in which the bow will tend to turn while, if the rotation of the rotor is clockwise when looking from rear.

(OR)

2) a) An aero-plane makes a complete half circle of 50 m radius towards left in a time of 20 seconds when flying at 200kmph. The rotary engine and the propeller of the plane has a mass of 400kg and a radius of gyration of 0.3 m. The engine rotor rotates at 2400 rpm clockwise when seen from the rear. Find the gyroscopic couple on the air craft and state its effect on the aero-plane.
   b) Explain the gyroscopic effect on four wheeled vehicles.

3) Determine the required input torque on the crank of a slider crank mechanism for the static equilibrium when the applied piston load is 1500N. The lengths of the crank and the connecting rod are 40mm and 100mm respectively and the crank has turned through 45^0 from the inner-dead centre.

(OR)

4) Synthesize a four bar linkage using freudenstein's equation to generate the function $y=x^{1.8}$ for the interval $1 \leq x \leq 5$. The input crank is to start from $\theta_s=30^0$ and is to have a range of 90^0.the output follower is to start at $\phi_s=0^0$ and is to have a range of 90^0. Take three accuracy points at x= 1,3and 5.

5) The turning moment diagram for a petrol engine is drawn to a vertical scale of 1 mm to 6 N-m and a horizontal scale of 1 mm to 1^0. The turning moment repeats itself after every half revolution of engine. The areas above and below the mean torque line are 305, 710, 50, 350, 980 and 275 mm^2. The rotating parts amounts to a mass of 40kg at a radius of gyration of 140mm. calculate the coefficient of fluctuation of speed if the speed of the engine is 1500 r.p.m.

(OR)

6) A cone clutch with a semi-cone angle of 15^0 transmits 10KW at 600 r.p.m. the normal pressure intensity between the surfaces in contact is not to exceed 100 KN/m^2. The width of the friction surfaces is half of the mean diameter. Assume $\mu=0.25$. determine
   i) The outer and inner diameters of the plate
   ii) Width of the cone face.
   iii) The axial force to engage the clutch.

7) A machine part having a mass of 2.5kg vibrates in a viscous medium. A harmonic exciting force of 30N acts on the part and causes a resonant amplitude of 14mm with a period of 0.22 second then,
   i) Find the damping coefficient
   ii) If the frequency of the exciting force is changed to 4Hz, determine the increase in the amplitude of the forced vibrations upon the removal of the damper

(OR)

8) The information related to a single-cylinder reciprocating engine are given as followed: mass of reciprocating parts = 40 kg
   Mass of revolving parts =30 kg at crank
   Speed=150 rpm; stroke=350mm
   If 60% of the reciprocating parts and all the revolving parts are to be balanced, determine,
      (i) Balance mass required at a radius 320mm
      (ii) Un balanced force when the crank has turned 45^0 from the top dead centre.

9) In a spring controlled governor, the controlling force curve is a straight line. The balls are 400mm apart when the controlling force is 1500 N and 240 mm apart when it is 800N. The mass of each ball is 10 kg. Determine the speed at which the governor runs when the balls are 300 mm apart. By how much should the initial tension be increased to become isochronous governor? Also find isochronous speed.

(OR)

10) Each ball a porter governor has a mass of 6kg and the mass of sleeve is 40kg. The upper arms are 300mm long and Pivoted in the axis of rotation. As the lower arms are 250mm long and attached to the sleeve at a distance of 40mm from the axis. Determine the equilibrium speed of the governor for a radius of rotation of 150mm for 1% change in speed. Also find the 'effort' and 'power' for the same speed change.