# MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)

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

## II B.TECH II SEMESTER REGULAR END EXAMINATIONS, MAY-2019

Subject: **Thermal Engineering-I**

Branch: ME

Time: **3 hours**                                                                 Max. Marks: 60

### PART – A

Answer **ALL** questions of the following                             5x2Marks=10 Marks

1. Define the volumetric efficiency of an engine

2. What is the Normal combustion in internal combustion Engine?

3. Define Indicated power and Friction power?

4. State how are the air compressors classified?

5. What is slip factor and a pressure coefficient?

### PART-B

Answer ALL Questions of the following                             5x10 Marks= 50Marks

1. a) What are different air standard cycles used in IC engines? Explain.       [4M]
   b) Explain the following:                                                     [6M]

       i. Time loss factor    ii. Heat transfer factor    iii. Exhaust blow down factor

OR

2. Find the thermal efficiency of and Otto cycle working with Maximum temperature of $1400^{\circ}c$ and minimum temperature of $42\ ^{\circ}c$ . If the compression ratio is 10 and pressure of air at the beginning of the compression is 1.5 bar, then the estimate mean effective pressure.

3. a) What is delay period and what are the factors that affect the delay period?
   b) Explain the phenomenon of knock in CI engines.

OR

4. Explain what is meant by abnormal combustion and knocking in SI Engines in details ?

5. a) Define mean effective pressure and distinguish between brake mean effective pressure and indicated mean effective pressure.
   b) A six cylinder, gasoline engine operates on the four-stroke cycle. The bore of each cylinder is 80 mm and the stroke 100 mm. the clearance volume per cylinder is 70 cc. At a speed of 4000 rpm the fuel consumption is 20 kg/hr and the torque developed is 150 Nm. Calculate
       i. Brake power    ii. Brake mean effective pressure
       iii. Brake thermal efficiency if the calorific value of the fuel is 43000 kJ/kg and
       iv. The relative efficiency on a brake power basis assuming the engine works on the constant volume cycle. $\gamma = 1.4$ for air.

OR

6. A four cylinder, four stroke petrol engines has a 10 cm bore, 15 cm stroke and uses a compression ratio of 6. The engine develops 25 kW indicated power at 2000 rpm. Find the mean indicated pressure and air standard efficiency. Also calculate the fuel consumption per hour, if the indicated thermal efficiency is 30%. Take the calorific value of fuel as 42 MJ/kg.

7.  a) Draw p-v and T-S diagram for single stage reciprocating air compressor, without *clearance*. Derive the expression for the work done. When compression is. i) Isothermal. Ii) Isentropic.

b) A three stage single acting reciprocating air compressor delivers 2.5 m³ of free air per minute from 1 bar to 72 bar. Calculate the power required to operate compressor if n = 1.3. The mean piston speed is 140 m/min. Find the piston area, neglecting the clearance volume..

OR

8.  a) Describe with a neat sketch the construction and working of a single-stage single-acting reciprocating air compressor.

b) A two-stage compressor delivers 2.2 m³ free air per minute. The pressure and temperature of air at the suction are 1 bar 25 °C respectively. The pressure at the delivery is 55 bar. The clearance in the LP cylinder is 5% and also in HP cylinder is 5% of the stroke. Assuming perfect intercooling between the two stages, find the minimum power required to run the compressor at 210 r.p.m. law of compression and re-expansion in both the cylinders is $pV^{1.3} =$ constant.

9.  a) With a neat sketch explain the working principle of centrifugal compressor. **Module-5(G)**

b) A centrifugal compressor used as a supercharger for aero-engines handles 150 kg/min. of air. The suction pressure and temperature are 1 bar and 290 K. The suction velocity is 80 m/s. after compression in the impeller the conditions are 1.5 bar, 345 K and 220 m/s. calculate:

    i. Isentropic efficiency. ii. Power required to drive the compressor.

It may be assumed that K.E of air gained in the impeller is entirely converted into pressure in the diffuser.

OR

10. a) A roots blower compresses 0.08 m³ of air from 1 bar to 1.5 bar per revolution. Calculate the compressor efficiency.

b) Explain the construction and working of axial flow compressor.

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## II B.TECH II SEMESTER REGULAR END EXAMINATIONS, MAY-2019

Subject: **Machine Drawing**

Branch: **ME**

Time: 3 hours                                                                        Max. Marks: 60

### PART – A

Answer any **TWO** questions of the following                          2x10Marks=20 Marks

1.  Sketch the following thread profiles for a nominal diameter of 25 mm and pitch 3 mm and give their applications:
    (*a*) BSW thread, (*b*) Buttress thread (*c*) Square thread (*d*) ACME thread and
    (*e*) Worm thread.
2.  Sketch the required views indicating the proportions of butt muff coupling to connect two shafts, each of diameter 30mm.
3.  Sketch the conventional representation of the following
    a) Liquid    b) Wood   c) Concrete                d) Marble
4.  Draw the sectional view from the front, and view from the side of a cotter joint with sleeve used to connect two rods of 30 mm diameter each.

### PART-B

Compulsory Question                                                              1x40 Marks= 40Marks

1.  Assemble all parts of the screw jack, shown in Figure and draw the following views:

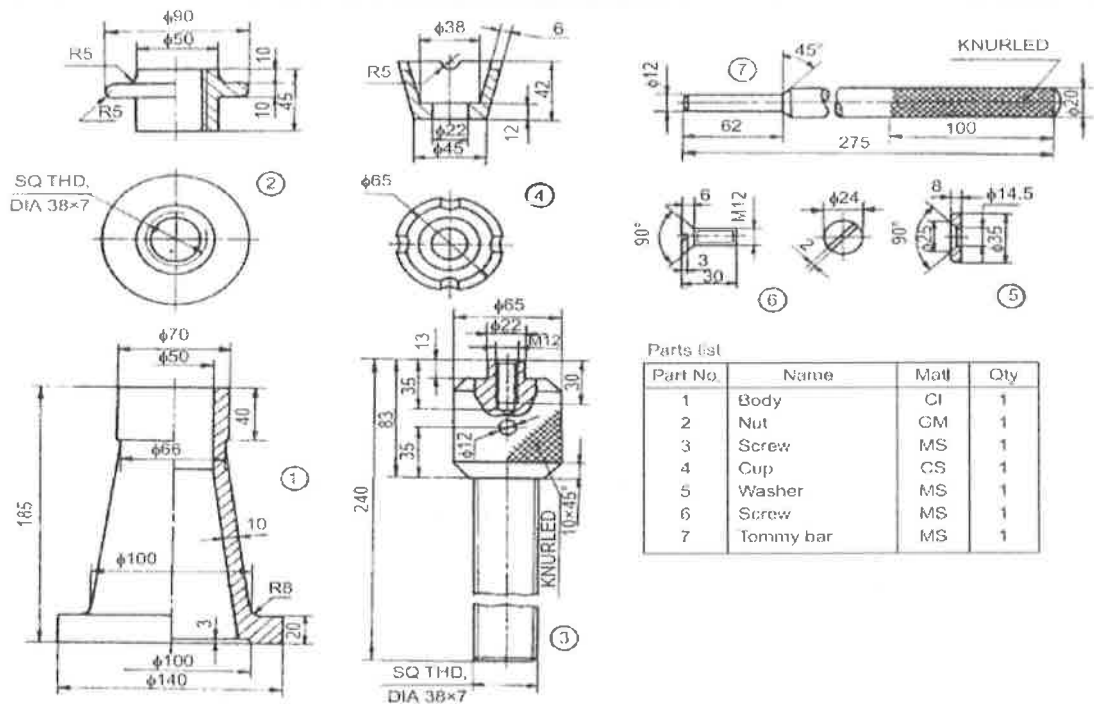    (i) Half sectional view from the front, and         View from above.



Figure: Details of screw jack

Code No.: **70315**

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## II B.TECH II SEMESTER REGULAR END EXAMINATIONS, MAY-2019
Subject: **Production Technology**
Branch: ME

Time: 3 hours

Max. Marks: 60

**PART – A**

Answer **ALL** questions of the following

5x2Marks=10 Marks

1. Summarize the various functions of riser.
2. Explain the purpose of inert gas used in TIG welding.
3. What is meant by Strain Hardening.
4. List out all the Forging Defects.
5. State the limitations of Plastics.

**PART-B**

Answer **ALL** questions of the following

5x10 Marks= 50Marks

1. a) Explain the solidification of a pure metal with sketch.
   b) Explain with a neat sketch die casting. State its advantages and disadvantages.
   **(OR)**
2. Define pattern. What are the various types of patterns?
3. What is the difference between consumable and non-consumable electrode? For which process does a filler metal has to be added by a separate mechanism.
   **(OR)**
4. Explain the principle of Resistance Welding. List out various Resistance Welding Processes and explain any one among them.
5. a) Explain the principle of rolling with a neat sketch.
   b) Classify the various types of rolling mills.
   **(OR)**
6. a) What are the advantages of Hot Working and Cold Working of Metals?
   b) Describe the Wire Drawing process with a neat sketch.
7. a) Explain with sketches the difference between Direct and Indirect Extrusion.
   b) What are the specific applications of Hydrostatic Extrusion?
   **(OR)**
8. a) State the advantages and disadvantages of Forging.
   b) Explain the working principle of Roll Forging with a neat sketch.
9. Explain the stretch Blow – Moulding process with applications.
   **(OR)**
10. a) What are Thermosetting Plastics? What are their characteristics?
    b) Compare Thermosetting Plastics with Thermoplastics?

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## II B.TECH II SEMESTER REGULAR END EXAMINATIONS, MAY-2019

Subject: **Probability and Statistics**

Branch: **Common to CE, ME, CSE, IT & MINING**

Time: **3 hours**                                                                 Max. Marks: **60**

### PART – A

Answer **ALL** questions of the following                          5x2Marks=10 Marks

1. Define mode. Explain how it is calculated for individual and discrete series.
2. Define mutually exclusive events and give two examples.
3. Write moment generating function of Normal Distribution.
4. Write the procedure for testing of hypothesis.
5. Define chi square test

### PART-B

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

1. Calculate coefficient of skewness based on Quartiles

| Profit | Below 10 | 10-20 | 20-30 | 30-40 | 40-50 | Above 50 |
|---|---|---|---|---|---|---|
| No of Companies | 5 | 12 | 20 | 16 | 5 | 2 |

**OR**

2. Calculate the Mean and Standard Deviation from the following data:

| Value | 90-99 | 80-89 | 70-79 | 60-69 | 50-59 | 40-49 | 30-39 |
|---|---|---|---|---|---|---|---|
| Frequency | 2 | 12 | 22 | 20 | 14 | 4 | 1 |

3. a) State and prove multiplication theorem of probability.
   b) Determine i) $P(B/A)$  ii) $P(A/B^c)$. If A and B are the events with  $P(A) = 1/3$,  $P(B) = ¼$, $P(A \cup B) = ½$.

**OR**

4. a) .In a committee of 25 members, each member is proficient either Mathematics or in statistics or in both. If 19 of them are proficient in Mathematics,16 in statistics, Find the probability that a person selected from the committee is proficient in both.
   b) A card is drawn from a well shuffled pack of cards. What is the probability that is either a spade or an ace?

5. A random variable X has the following probability function:

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| P(x) | 0 | k | 2k | 2k | 3k | $K^2$ | $2k^2$ | $7k^2+K$ |

   i) Determine k ii) evaluate $P(x<6)$, $P(x \geq 6)$,  $P(0<x<5)$ and $P(0 \leq x \leq 4)$ iii) if $P(x \leq L) > ½$, find minimum value of L  iv) Determine the distribution function of X        v) Mean vi) variance

**OR**

6. Derive the mean and variance of a binomial distribution?

7. a) In a sample of 600 students of a certain college, 400 are found to use ball pens. In another college from a sample of 900 students, 450 were found to use ball pens. Test whether 2 colleges are significantly different with respect to the habit of using ball pens.

b) Assuming that $\sigma = 20.0$, how large a random sample be taken to assert with probability 0.95 that the sample mean will not differ from the true mean by more than 3.0 points?

<div align="center">OR</div>

8. (a) Among 900 people in a state 90 are found to be chapatti eaters. Construct 99% confidence interval for the true proportion.

(b) A manufacturer claimed that atleast 95% of the equipment which he supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipment revealed that 18 were faulty. Test his claim at 5% level of significance.

9. The time taken by workers in performing a job by method I and method II is given below:

| Method I | 20 | 16 | 26 | 27 | 23 | 22 | - |
|----------|----|----|----|----|----|----|----|
| Method II | 27 | 33 | 42 | 35 | 32 | 34 | 38 |

Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly?

<div align="center">OR</div>

10. a) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test hypothesis that the true variances are equal.

b) From the following data, find whether there is any significant liking in the habit of taking soft drinks among the categories of employees.

| Soft Drinks | Clerks | Teachers | Officers |
|-------------|--------|----------|----------|
| Pepsi | 10 | 25 | 65 |
| Thums up | 15 | 30 | 65 |
| Fanta | 50 | 60 | 30 |

Code No.: **70314**

Time: **3 hours**                                                                       Max. Marks: **60**

## PART – A

Answer **ALL** questions of the following                        5x2Marks=10 Marks
1. Define the steering and pitching.
2. State D'Alembert's principle.
3. Distinguish between brakes and dynamometers?
4. Define static balancing.
5. What are the different types of governors?

## PART-B

Answer **ALL** questions of the following                        **5x10 Marks= 50Marks**
1. (a) The mass of the rotor turbine of a ship is 20 tonnes and has a radius of gyration of 0.6 m. Its speed is 2000 r.p.m. The ship pitches $6^\circ$ above and $6^\circ$ below the horizontal position. A complete oscillation takes 30 seconds and the motion is simple harmonic. Determine the following (i) The maximum gyroscopic couple (ii) Maximum angular acceleration (iii) the direction in which the bow will tend to turn when rising, if the motion of the rotor is clockwise when looking from the left.

(b) Explain the application of gyroscopic principles to aircrafts.

### (OR)

2. How do the effects of gyroscopic couple and centrifugal force make the rider of a two wheeler tilt on side? Derive a relation of the limiting speed of the vehicle.

3. Design a four-bar mechanism to generate a function $y = x^2$ for range of $x$ from 1 to 4. Assume θ vary from $30^0$ to $120^0$ and $\varphi$ vary from $60^0$ to $150^0$. The length of the fixed link is 40mm.Use Chebychev's spacing to determine the accuracy points.

### (OR)

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

5. Obtain the expression for torque transmitted in case of cone clutch considering uniform pressure.

**(OR)**

6. The areas above and below the mean torque line in a turning moment diagram of a multi cylinder are as follows -215, 251, -362, 234, -310, 300, -242, 374 and -30 mm2. The diagram has been drawn to a vertical scale of 1mm=500N.m and a horizontal scale of 1mm=6°. The mean speed of engine is 380rpm and total fluctuation of speed is ±2.5% of mean speed. The density of rim material is 8500 kg/m3 and width of the rim is 4.8 times its thickness. The hoop stress of the rim material is 10MPa. Determine the diameter and mass of the flywheel.

7. A shaft of 10 cm diameter and 100 cm long is fixed at one end and other end carries a flywheel of mass 80 kg. Taking young's modulus for the shaft material as 2 x 10⁶ kg/cm², find the natural frequency of longitudinal and transverse vibrations.

**(OR)**

8. (a) Explain, with sketches the different cases of damped vibrations.

(b) A cantilever shaft 50mm diameter and 300mm long has a disc of mass 100kg at its free end. The Young's modulus for the shaft material is 200GN/m². Determine the frequency of longitudinal and transverse vibration of the shaft.

9. (a) A Proell governor has all the four arms of length 250 mm. The upper and lower arms are pivoted on the axis of rotation of the governor. The extension arms of the lower links are 100mm long and parallel to the axis when the radius of ball path is 150 mm. the mass of each ball is 4.5 kg and the mass of central load is 36 kg. Determine the equilibrium speed of the governor.

(b) Explain the terms and derive an expressions for 'effort' and 'Power of a porter governor.

**(OR)**

10. A Porter governor has all four arms 250 mm long. The upper arms are attached on the axis of rotation and the lower arms are attached to the sleeve at a distance of 30 mm from the axis. The mass of each ball is 5 kg and the sleeve has a mass of 50 kg. The extreme radii of rotation are 150 mm and 200 mm. Determine the range of speed of the governor.

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## II B.TECH II SEMESTER REGULAR END EXAMINATIONS, MAY-2019

Subject: **Design of Machine Members-I**

Branch: ME

Time: 3 hours                                             Max. Marks: 60

## PART – A

Answer **ALL** questions of the following                    5x2Marks=10 Marks

1. Differentiate between modulus of elasticity and modulus of rigidity

2. Write the different applications of screwed fasteners.

3. Define the terms (i) Spring Index (ii) stiffness of the spring

4. What are the factors affecting the endurance limit.

5. Define critical speed of the shafts.

## PART-B

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

1.  **a)** A wrought iron bar 50 mm in diameter and 2.5 m long transmits a shock energy of 100 N-m. Find the maximum instantaneous stress and the elongation. Take E = 200 GN/m$^2$. **(7)**

    **b)** Why maximum shear stress theory is generally applicable for ductile material. **(3)**

### OR

2.  A solid circular shaft, 20 mm in diameter, is subjected to torsional shear stress, which varies from 0 to 35 N/mm2 and at the same time, is subjected to an axial stress that varies from -15 to +30 N/mm$^2$. The frequency of variation of these stresses is equal to the shaft speed. The shaft is made of steel FeE 400(Sut=540 N/mm$^2$ and Syt=400 N/mm$^2$ and the corrected endurance limit of the shaft is 200 N/mm$^2$. Determine the factor of safety.

3.  Explain the influence of stress concentration in the design of machine elements? What are the principal causes of stress concentration? Explain with suitable sketches?

### OR

4.  a) Explain Fatigue, and the factors which affect Fatigue failure.

    b) What is meant by a bolt of uniform strength?

5.  a) A plate of 100 mm width and 12 mm thick is to be welded to another plate by means of double parallel fillet welds as shown in Fig. a. The joint is subjected to a load of 80 KN. Determine the length of the weld, $l$, if the permissible shear stress in the weld is not to exceed 50 MPa. Assume size of the weld = 8 mm.
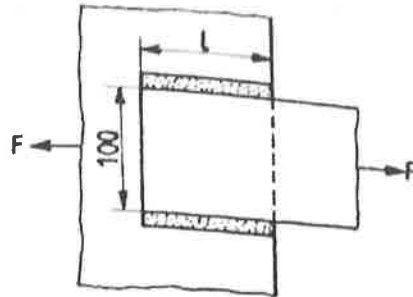


b) Explain the design procedure for the eccentrically loaded bolted joint.

**OR**

6.  Show by neat sketches the various modes of failure of riveted joints.

7.  a) Find the diameter of shaft required to transmit 60 kW at 150 rpm if the maximum torque is likely to exceed the mean torque by 25% for a maximum permissible torsional shear stress of 60 N/mm$^2$. Also find the angle of twist for a length of 2.5 meters. Take G = 80 GPa.

    b) Explain the design procedure of flange coupling

**OR**

8.  A cast iron pulley transmits 10 KW at 400 rpm. The diameter of the pulley is 1.2meter and it has four straight arms of elliptical cross section. In which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15 MPa.

9.  A helical torsion spring is subjected to a torque of 5 N-m. Design the spring, using the following particulars: Angle of twist = 90$^0$; Spring Index – 8; Modulus of elasticity = 2x10$^5$ MPa; Allowable stress = 450 MPa.

**OR**

10. Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, G = 84 kN/mm$^2$. Neglect the effect of stress concentration. Draw a fully dimensioned sketch of the spring, showing details of the finish of the end coils.