

Total No. of Pages 1

Roll No.

FOURTH SEMESTER

B.E. (ME)

MID SEM EXAMINATION

March **2007**

ME-211 THERMAL ENGINEERING-I

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Assume suitable missing data, if any.

- 1[a] In an ideal Diesel cycle, the pressure and temperature at the start of compression are 1.03 bar and 27°C respectively. The maximum pressure in the cycle is 50 bar and heat supplied during the cycle is 545 kJ/kg. Determine (i) Cut off ratio (ii) Heat rejected (iii) the air standard efficiency. Assume $\gamma = 1.4$ and $C_p = 1.004$ kJ/kg K for air. 5
- [b] Discuss the value timing diagram of a four stroke petrol engine. 2
- 2[a] Discuss the effect of mean effective pressure, compression ratio and ratio of specific heats on the performance of a I.C. engine. 3
- [b] Define : (i) W.B.T. (ii) Relative humidity (iii) D.P.T. Describe briefly the process of cooling and dehumidification. 4
- 3[a] Discuss the effect of pressure ratio on the performance of the reciprocating compressors. 2
- [b] The L.P cylinder of a two stage double acting air compressor running at 120 rpm has 50 cm diameter and 75 cm stroke. It draws air at a pressure of 95 KPa and 20°C and compresses it to 3 bar as per the law of compression $PV^{1.35} = C$. The air is then delivered to an intercooler where it is cooled at constant pressure to 35°C, and it is then further compressed adiabatically to 10 bar in H.P. cylinder. Determine the power required drive the compressor or motor. Assume the mechanical efficiency of the compressor as 90%. 4

Total No. of Pages 2

Roll No.

FOURTH SEMESTER

B.E. (ME)

MID SEM EXAMINATION

March 2007

ME-212 MECHANICS OF SOLIDS-I

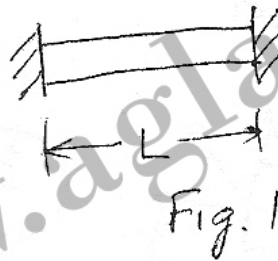
Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

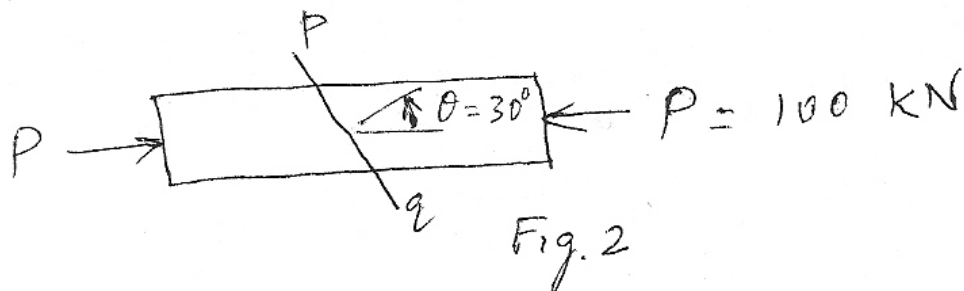
Assume suitable missing data, if any.

- 1[a] Define state of stress at a point and explain stress-strain diagram for mild steel. 2
- [b] A bar, shown in Fig.1, is fixed at both ends. If temperature of the bar is raised by ΔT , find the support reactions and stresses developed in the bar. Cross sectional area of bar is A , modulus of elasticity is E and coefficient of thermal expansion is α . 2



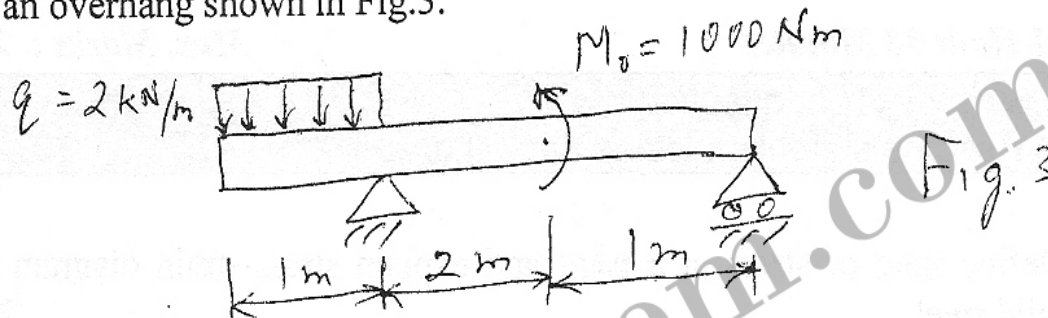
- 2 A prismatic bar in compression (Fig.2) has a cross-sectional area $A = 1200 \text{ mm}^2$ and carries a load of $P = 100 \text{ kN}$. Determine the stresses acting on a plane 'pq' cut through the bar at $\theta = 30^\circ$. Then show the complete state of stress for $\theta = 30^\circ$.

Also find maximum normal stress and maximum shear stress in the bar. 4



- 3 A solid shaft of diameter 60 mm is to be designed using an allowable shear stress of 40 MPa and an allowable angle of twist per unit length $\theta = 1^\circ$ per meter. Determine the maximum permissible torque that may be applied to the shaft, assuming shear modulus of 80 GPa. 4

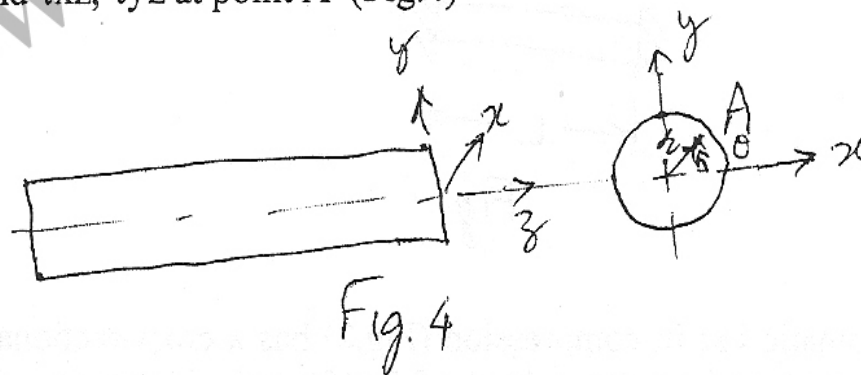
- 4 Construct shear-force and bending-moment diagrams for the beam with an overhang shown in Fig.3. 4



- 5 Derive expression for shear stress for torsion of right circular cylinder of radius R, length L by end couples T. 4

$$\left(\tau_{\theta z} = \frac{Tr}{I_p} \right)$$

Also find τ_{xz} , τ_{yz} at point A (Fig.4)



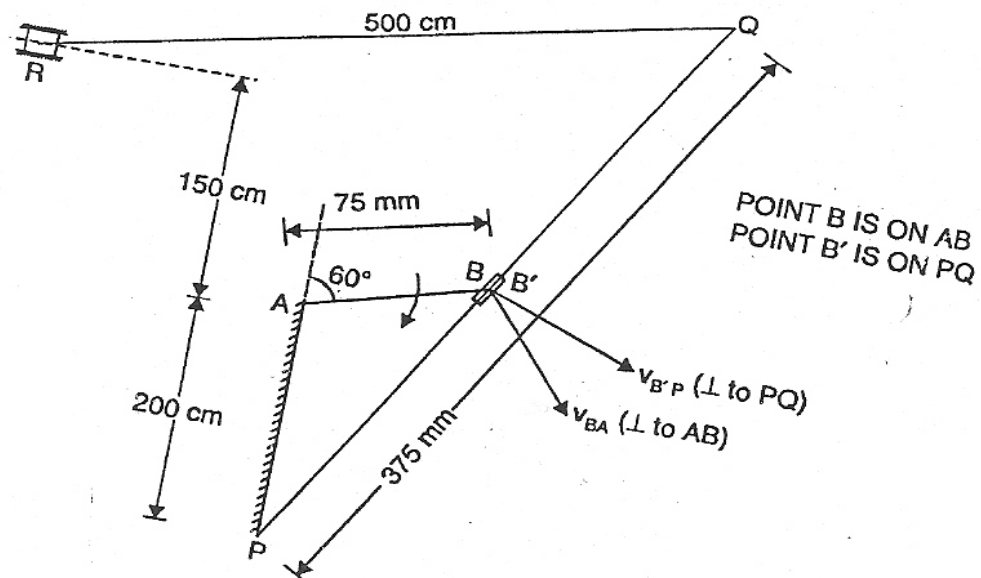
FOURTH SEMESTER**B.E. (ME)****MID SEM EXAMINATION****March 2007****ME-213 KINEMATICS OF MACHINES****Time: 1 Hour 30 Minutes****Max. Marks : 20****Note : Answer ALL questions.**

Assume suitable missing data, if any.

- 1 Compare the following
 - [a] Crank-slotted-lever mechanism and whitworth quick return mechanism
 - [b] Completely constrained motion and successfully constrained motion.
 - [c] Flat-faced and roller follow of cam. 4.5

- 2 Draw displacement, velocity, acceleration and jerk diagram for the follower of cam having SHM during ascent and uniform acceleration & retardation during return motion. The angle of ascent = 48° , angle of dwell between ascent and descent = 42° and angle of return = 60° , the lift of the follower = 40 mm. The cam rotates at 360 rpm anticlockwise. 5.5

- 3 The input crank AB has an angular velocity of 10 rad/s with an angular acceleration of 2 rad/s/s when it is at an angle of 135° with the line of fixed centres AP. Determine acceleration of tool box R. 10



FOURTH SEMESTER**B.E. (ME)****MID SEM EXAMINATION****March 2007****ME-214 ELECTRICAL TECHNOLOGY-II****Time: 1 Hour 30 Minutes****Max. Marks : 20****Note : Answer ALL questions.**

Assume suitable missing data, if any.

1[a] Explain the following (any THREE):

- i. Why are large squirrel cage 3-phase induction motor are not started direct on line. Explain auto transformer starting of 3-phase squirrel cage induction motor.
- ii. Discuss the capacitor start and run single phase induction motor, with its circuit diagram and typical torque speed characteristics.
- iii. For a 3-phase induction motor, show that,
 $P_g : \text{Rotor ohmic loss} : P_m = 1 : s : (1-s)$
Where P_g = air gap power, s = operating slip,
 P_m = internal mechanical power developed
- iv. Define Load factor, Diversity factor and Demand factor for a given electrical power system.
- v. State and explain laws of illumination. 3x3

2 A 7.5 kw, 440 V, 3-phase star-connected 50 Hz, 4 pole squirrel cage induction motor develops full load torque at a slip of 5% when operated at rated voltage and frequency. Motor parameters are as below: $r_1 = 1.32\Omega$ $x_1 = x_2' = 1.46\Omega$, $x_\phi = 22.7\Omega$

- (i) Determine rotor resistance, r_2 .
- (ii) Determine maximum motor torque at rated voltage and slip at which it will occur Neglect rotational losses. 4

3 A test on the main winding of a 1 kw, 4-pole, 215 V, 50Hz, single phase induction motor gave the following results:

N.L Test : 215 V, 3.9 A, 185 W.

B.R. Test : 85 V, 9.8 A, 390 W

Given $r_1 = 1.6\Omega$

Calculate the equivalent circuit parameters of the motor and draw the equivalent circuit using double revolving field theory. **3+1**

- 4 A consumer consumes one million units of electrical energy per year and his annual load factor is 50%. The tariff in force is Rs. 1200 per kw plus Rs.2.40 per unit. Estimate the saving in his energy cost, which would result if he improves his load factor to 100 percent. **3**

FOURTH SEMESTER

B.E. (ME/PE)

MID SEM EXAMINATION

March 2007

ME/PE-215 ELECTRONICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

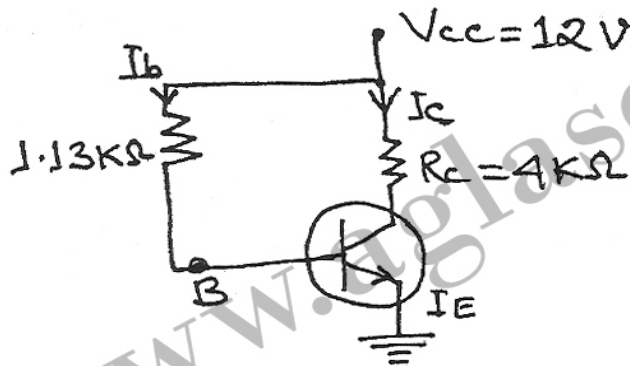
Assume suitable missing data, if any.

- 1 What is zener effect? Explain the function of a zener diode and draw its characteristics. Explain how a zener diode is used as a voltage regulator. 4

- 2[a] Explain the working of a bridge rectifier. 2

- [b] Explain static and Dynamic Resistance of diode. 2

3



In the figure above, Si transistor with $\beta = 100$ is used for fixed biasing. Determine (i) Base current (ii) Collector current, (ii) V_c , V_B and V_{CB} (iv) Operating point. 4

- 4[a] Explain with the help of a diagram Q-point and load lines. 2

- [b] For a transistor, collector current is 6.25 mA and the base current is 100 μ A. The collector to base leakage current is 5 μ A. Determine the emitter current and α_{DC} . 2

- 5 Write short notes on any TWO of the followings:

- [a] Clipper circuit
[b] Avalanche and zener breakdown
[c] Intrinsic and Extrinsic semiconductor
[d] Ripple factor. 4